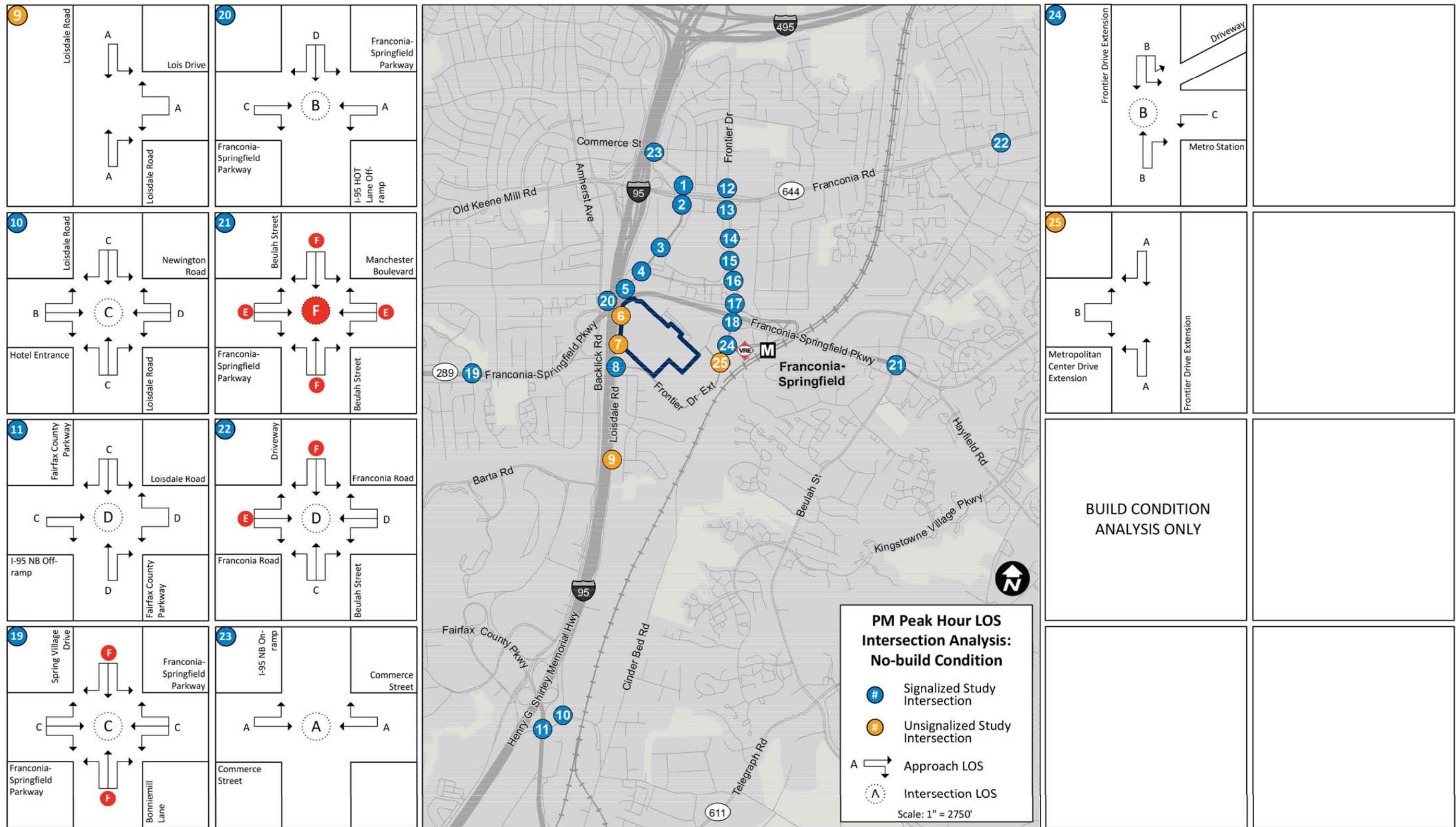


Figure 4-11: No-build Condition Intersection LOS for PM Peak Hour (continued)



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at unacceptable conditions (LOS F and, depending on intersection, also LOS E; see report text for more details). Intersection #23 is analyzed only during the PM peak hour.

Table 4-19: No-build Condition for AM and PM Peak Hours

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
1	Loisdale Road/Commerce Street & Franconia Road (Westbound) (Signalized)							
	WB (Franconia Rd)	L	92.8	F		90.8	F	
	WB (Franconia Rd)	T	29.8	C		32.3	C	
	WB (Franconia Rd)	R	1.5	A		0.8	A	
	WB Overall (Franconia Rd)		20.8	C		25.4	C	
	NB (Commerce St)	L	0.7	A		2.4	A	
	NB (Commerce St)	T	1.5	A		1.9	A	
	NB Overall (Commerce St)		1.1	A		2.3	A	
	SB (Commerce St)	T	70.6	E		73.8	E	
	SB (Commerce St)	R	68.1	E		64.0	E	
	SB Overall (Commerce St)		69.5	E		71.1	E	
	Overall		24.0	C	Pass	31.1	C	Pass
2	Loisdale Road/Commerce Street & Franconia Road (Eastbound) (Signalized)							
	EB (Franconia Rd)	L	72.9	E		76.4	E	
	EB (Franconia Rd)	T	38.0	D		52.0	D	
	EB (Franconia Rd)	R	0.7	A		4.9	A	
	EB Overall (Franconia Rd)		23.1	C		21.7	C	
	NB (Loisdale Rd)	T	70.5	E		72.1	E	
	NB (Loisdale Rd)	R	63.4	E		55.4	E	
	NB Overall (Loisdale Rd)		69.0	E		69.5	E	
	SB (Loisdale Rd)	L	2.7	A		0.1	A	
	SB (Loisdale Rd)	T	2.7	A		0.2	A	
	SB Overall (Loisdale Rd)		2.7	A		0.2	A	
	Overall		35.7	D	Pass	32.1	C	Pass

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
3	Loisdale Road & Loisdale Court/Mall Access (Signalized)							
	EB (Loisdale Court)	L	74.0	E		76.0	E	
	EB (Loisdale Court)	LT	74.1	E		74.0	E	
	EB (Loisdale Court)	R	65.6	E		53.5	D	
	EB Overall (Loisdale Court)		72.0	E		68.3	E	
	WB (Mall Access)	L	67.6	E		65.1	E	
	WB (Mall Access)	T	67.2	E		53.8	D	
	WB (Mall Access)	R	66.5	E		53.9	D	
	WB Overall (Mall Access)		66.9	E		57.7	E	
	NB (Loisdale Rd)	L	2.1	A		11.9	B	
	NB (Loisdale Rd)	T	3.4	A		12.0	B	
	NB (Loisdale Rd)	R	0.0	A		0.0	A	
	NB Overall (Loisdale Rd)		3.1	A		11.3	B	
	SB (Loisdale Rd)	L	3.2	A		7.0	A	
	SB (Loisdale Rd)	T	5.4	A		13.3	B	
	SB (Loisdale Rd)	R	4.9	A		10.0	B	
	SB Overall (Loisdale Rd)		5.0	A		11.6	B	
	Overall		9.1	A	Pass	21.9	C	Pass
4	Loisdale Road & Ramp from NB I-95/Spring Mall Drive (Signalized)							
	EB (Ramp from NB I-95)	L	66.4	E		69.0	E	
	EB (Ramp from NB I-95)	T	67.8	E		68.8	E	
	EB (Ramp from NB I-95)	R	59.1	E		61.4	E	
	EB Overall (Ramp from NB I-95)		66.4	E		68.8	E	
	WB (Spring Mall Dr)	L	17.4	B		68.9	E	
	WB (Spring Mall Dr)	R	119.4	F		52.5	D	
	WB Overall (Spring Mall Dr)		87.8	F		60.1	E	
	NB (Loisdale Rd)	TR	14.9	B		20.5	C	
	NB (Loisdale Rd)	R	8.5	A		16.2	B	
	NB Overall (Loisdale Rd)		13.8	B		19.8	B	
	SB (Loisdale Rd)	L	4.2	A		5.5	A	
	SB (Loisdale Rd)	T	4.6	A		4.1	A	
	SB Overall (Loisdale Rd)		4.5	A		4.7	A	
	Overall		32.9	C	Pass	23.7	C	Pass

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
5	Loisdale Road & Metropolitan Center Drive (Signalized)							
	WB (Metropolitan Center Dr)	L	69.0	E		71.6	E	
	WB (Metropolitan Center Dr)	R	68.2	E		69.2	E	
	WB Overall (Metropolitan Center Dr)		68.3	E		69.8	E	
	NB (Loisdale Rd)	T	2.2	A		1.8	A	
	NB (Loisdale Rd)	R	1.6	A		1.4	A	
	NB Overall (Loisdale Rd)		2.2	A		1.8	A	
	SB (Loisdale Rd)	L	0.4	A		0.9	A	
	SB (Loisdale Rd)	T	0.7	A		0.8	A	
	SB Overall (Loisdale Rd)		0.7	A		0.8	A	
	Overall		6.7	A		Pass	4.1	
6	Loisdale Road & Northern Entrance Road to GSA Facility (Access to Building A, 66808 & 6610 Loisdale Road) (TWSC)							
	WB (N Ent Rd to GSA)	L	31.1	D		0.0	A	
	WB (N Ent Rd to GSA)	R	13.6	B		12.2	B	
	WB Overall (N Ent Rd to GSA)		16.5	C		12.2	B	
	SB (Loisdale Rd)	L	9.3	A		8.6	A	
	SB Overall (Loisdale Rd)		0.5	-		0.0	-	
	Overall		0.3	-		Pass	0.1	
7	Loisdale Road & Southern Entrance Road to GSA Facility (Access to Building B, 7000 Loisdale Road) (TWSC)							
	WB (S Ent Rd to GSA)	L	51.4	F		41.1	E	
	WB (S Ent Rd to GSA)	R	13.3	B		11.2	B	
	WB Overall (S Ent Rd to GSA)		20.2	C		17.7	C	
	SB (Loisdale Rd)	L	10.2	B		8.3	A	
	SB Overall (Loisdale Rd)		2.1	-		0.1	-	
	Overall		1.6	-		Pass	0.9	
8	Loisdale Road & Frontier Drive Extension (Signalized)							
	WB (Frontier Dr Ext)	L	31.4	C		51.1	D	
	WB (Frontier Dr Ext)	R	28.1	C		27.5	C	
	WB Overall (Frontier Dr Ext)		30.8	C		47.5	D	
	NB (Loisdale Rd)	T	11.8	B		13.1	B	
	NB (Loisdale Rd)	R	8.1	A		9.9	A	
	NB Overall (Loisdale Rd)		10.5	B		12.7	B	
	SB (Loisdale Rd)	L	5.6	A		7.0	A	
	SB (Loisdale Rd)	T	3.4	A		22.2	C	
	SB Overall (Loisdale Rd)		3.8	A		21.4	C	
	Overall		9.2	A		Pass	23.8	

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
9	Loisdale Road & Lois Drive (TWSC)							
	WB (Lois Drive Dr)	LR	16.7	C		21.7	C	
	WB Overall (Lois Drive Dr)		16.7	C	Pass	21.7	A	Pass
	SB (Loisdale Rd)	L	9.1	A		8.3	C	
	SB Overall (Loisdale Rd)		0.3	-	Pass	0.1	-	Pass
	Overall		0.7	-	Pass	0.3	-	Pass
10	Loisdale Road & Hotel Entrance/Newington Road (Signalized)							
	EB (Hotel Entrance)	LTR	30.7	C		18.0	B	
	EB Overall (Hotel Entrance)		30.7	C	Pass	18.0	B	Pass
	WB (Newington Rd)	LT	46.1	D		59.0	E	
	WB (Newington Rd)	R	28.4	C		18.4	B	
	WB Overall (Newington Rd)		38.8	D	Pass	50.1	D	Pass
	NB (Loisdale Rd)	L	8.4	A		18.6	B	
	NB (Loisdale Rd)	T	9.4	A		19.4	B	
	NB (Loisdale Rd)	R	14.8	B		31.7	C	
	NB Overall (Loisdale Rd)		11.1	B	Pass	23.6	C	Pass
	SB (Loisdale Rd)	L	7.6	A		27.5	C	
	SB (Loisdale Rd)	T	8.5	A		25.6	C	
	SB (Loisdale Rd)	R	8.0	A		17.9	B	
	SB Overall (Loisdale Rd)		8.2	A	Pass	26.0	C	Pass
	Overall		16.7	B	Pass	31.6	C	Pass
11	Loisdale Road/I-95 (N) Ramp C & D & Fairfax County Parkway (Signalized)							
	EB (I-95 Northbound Off-Ramp)	T	117.0	F		84.6	F	
	EB (I-95 Northbound Off-Ramp)	R	0.3	A		0.2	A	
	EB Overall (I-95 Northbound Off-Ramp)		55.5	E	Fail	27.3	C	Pass
	WB (Loisdale Rd)	L	125.3	F		74.5	E	
	WB (Loisdale Rd)	R	43.1	D		37.1	D	
	WB Overall (Loisdale Rd)		69.5	E	Fail	48.1	D	Pass
	NB (Fairfax County Pkwy)	T	29.6	C		49.3	D	
	NB (Fairfax County Pkwy)	R	24.3	C		9.5	A	
	NB Overall (Fairfax County Pkwy)		28.7	C	Pass	46.2	D	Pass
	SB (Fairfax County Pkwy)	L	84.0	F		97.1	F	
	SB (Fairfax County Pkwy)	T	30.6	C		23.4	C	
	SB (Fairfax County Pkwy)	R	0.8	A		1.0	A	
	SB Overall (Fairfax County Pkwy)		31.2	C	Pass	24.5	C	Pass
	Overall		35.7	D	Pass	37.7	D	Pass

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
12	Frontier Drive & Franconia Road (Westbound) (Signalized)							
	WB (Franconia Rd)	L	73.3	E		64.3	E	
	WB (Franconia Rd)	TR	44.2	D		35.3	D	
	WB Overall (Franconia Rd)		48.0	D		41.2	D	
	NB (Frontier Dr)	L	6.1	A		3.5	A	
	NB (Frontier Dr)	T	2.6	A		1.5	A	
	NB Overall (Frontier Dr)		5.9	A		3.3	A	
	SB (Frontier Dr)	TR	73.1	E		65.7	E	
	SB Overall (Frontier Dr)		73.1	E		65.7	E	
	Overall		30.7	C	Pass	24.6	C	Pass
13	Frontier Drive & Franconia Road (Eastbound) (Signalized)							
	EB (Franconia Rd)	L	46.1	D		49.8	D	
	EB (Franconia Rd)	T	26.7	C		30.4	C	
	EB (Franconia Rd)	R	0.6	A		0.6	A	
	EB Overall (Franconia Rd)		12.5	B		18.2	B	
	NB (Frontier Dr)	T	67.1	E		43.6	D	
	NB (Frontier Dr)	R	54.9	D		76.0	E	
	NB Overall (Frontier Dr)		64.9	E		51.3	D	
	SB (Frontier Dr)	LT	3.3	A		2.9	A	
	SB Overall (Frontier Dr)		3.3	A		2.9	A	
	Overall		38.5	D	Pass	31.5	C	Pass
14	Frontier Drive & Best Buy/Springfield Mall Lot Entrance (Signalized)							
	EB (Springfield Mall Lot Ent)	L	80.2	F		79.1	E	
	EB (Springfield Mall Lot Ent)	LTR	77.1	E		67.7	E	
	EB Overall (Springfield Mall Parking Lot Ent)		78.1	E		72.7	E	
	WB (Best Buy Ent)	L	207.5	F		77.3	E	
	WB (Best Buy Ent)	TR	22.6	C		67.4	E	
	WB Overall (Best Buy Ent)		148.2	F		72.2	E	
	NB (Frontier Dr)	L	105.9	F		101.9	F	
	NB (Frontier Dr)	T	29.4	C		6.9	A	
	NB (Frontier Dr)	R	37.2	D		16.9	B	
	NB Overall (Frontier Dr)		32.1	C		17.6	B	
	SB (Frontier Dr)	L	93.3	F		69.9	E	
	SB (Frontier Dr)	T	43.6	D		15.7	B	
	SB (Frontier Dr)	R	37.4	D		35.4	D	
	SB Overall (Frontier Dr)		46.8	D		26.6	C	
	Overall		41.8	D	Pass	30.8	C	Pass

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
15	Frontier Drive & Home Depot/Springfield Mall Garage Entrance (Signalized)							
	EB (Springfield Mall Garage Ent)	LT	80.6	F		76.7	E	
	EB (Springfield Mall Garage Ent)	R	74.1	E		74.1	E	
	EB Overall (Springfield Mall Garage Ent)		76.7	E		74.9	E	
	WB (Home Depot Ent)	LTR	247.0	F		75.3	E	
	WB Overall (Home Depot Ent)		247.0	F		75.3	E	
	NB (Frontier Dr)	L	212.1	F		87.0	F	
	NB (Frontier Dr)	T	20.4	C		5.0	A	
	NB (Frontier Dr)	R	6.2	A		2.6	A	
	NB Overall (Frontier Dr)		20.7	C		6.2	A	
	SB (Frontier Dr)	L	92.2	F		81.7	F	
	SB (Frontier Dr)	T	8.6	A		8.2	A	
	SB (Frontier Dr)	R	0.0	A		0.0	A	
	SB Overall (Frontier Dr)		21.1	C		21.5	C	
	Overall		37.3	D	Pass	19.8	B	Pass
16	Frontier Drive & Spring Mall Drive (Signalized)							
	EB (Spring Mall Dr)	L	54.3	D		57.2	E	
	EB (Spring Mall Dr)	LT	54.4	D		57.2	E	
	EB (Spring Mall Dr)	R	11.8	B		39.1	D	
	EB Overall (Spring Mall Dr)		20.5	C		41.8	D	
	WB (Spring Mall Dr)	LT	99.8	F		76.8	E	
	WB (Spring Mall Dr)	R	62.3	E		56.7	E	
	WB Overall (Spring Mall Dr)		84.8	F		69.6	E	
	NB (Frontier Dr)	L	69.3	E		67.4	E	
	NB (Frontier Dr)	T	14.6	B		24.4	C	
	NB (Frontier Dr)	R	11.0	B		16.6	B	
	NB Overall (Frontier Dr)		27.1	C		36.1	D	
	SB (Frontier Dr)	L	92.1	F		70.3	E	
	SB (Frontier Dr)	T	6.3	A		27.1	C	
	SB (Frontier Dr)	R	18.4	B		33.4	C	
	SB Overall (Frontier Dr)		9.9	A		29.7	C	
	Overall		22.8	C	Pass	38.4	D	Pass

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
17	Frontier Drive & Franconia-Springfield Parkway (Westbound) (Signalized)							
	WB (F-S Pkwy WB Off-ramp)	L	51.5	D		75.3	E	
	WB (F-S Pkwy WB Off-ramp)	LT	51.4	D		75.1	E	
	WB (F-S Pkwy WB Off-ramp)	R	2.2	A		4.4	A	
	WB Overall (F-S Pkwy WB Off-ramp)		6.1	A		7.9	A	
	NB (Frontier Dr)	L	1.2	A		4.8	A	
	NB (Frontier Dr)	T	3.0	A		9.9	A	
	NB Overall (Frontier Dr)		3.0	A		9.6	A	
	SB (Frontier Dr)	T	69.2	E		21.7	C	
	SB (Frontier Dr)	R	44.2	D		25.8	C	
	SB Overall (Frontier Dr)		66.3	E		23.3	C	
	Overall		31.3	C	Pass	15.5	B	Pass
18	Frontier Drive & Franconia-Springfield Parkway (Eastbound) (Signalized)							
	EB (F-S Pkwy EB Off-ramp)	L	30.7	C		82.1	F	
	EB (F-S Pkwy EB Off-ramp)	LT	30.8	C		82.8	F	
	EB (F-S Pkwy EB Off-ramp)	R	121.6	F		61.3	E	
	EB Overall (F-S Pkwy EB Off-ramp)		87.0	F		74.2	E	
	NB (Frontier Dr)	T	49.4	D		58.4	E	
	NB (Frontier Dr)	R	48.8	D		55.4	E	
	NB Overall (Frontier Dr)		49.3	D		57.9	E	
	SB (Frontier Dr)	L	1.1	A		1.6	A	
	SB (Frontier Dr)	T	5.4	A		1.0	A	
	SB Overall (Frontier Dr)		4.1	A		1.4	A	
	Overall		47.6	D	Pass	32.1	C	Pass

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour			
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	
19	Franconia-Springfield Parkway & Spring Village Drive/Bonniemill Lane (Signalized)								
	EB (Franconia-Springfield Pkwy)	L	160.7	F		140.4	F		
	EB (Franconia-Springfield Pkwy)	T	43.8	D		20.4	C		
	EB (Franconia-Springfield Pkwy)	R	6.5	A		15.3	B		
	EB Overall (Franconia-Springfield Pkwy)		44.8	D	Pass	22.7	C	Pass	
	WB (Franconia-Springfield Pkwy)	L	272.2	F		106.7	F		
	WB (Franconia-Springfield Pkwy)	T	8.2	A		19.2	B		
	WB (Franconia-Springfield Pkwy)	R	7.2	A		6.3	A		
	WB Overall (Franconia-Springfield Pkwy)		19.8	B	Pass	23.3	C	Pass	
	NB (Bonniemill Ln)	L	123.1	F		86.9	F		
	NB (Bonniemill Ln)	T	121.2	F		86.3	F		
	NB (Bonniemill Ln)	R	171.6	F		86.8	F		
	NB Overall (Bonniemill Ln)		166.2	F	Fail	86.8	F	Fail	
	SB (Spring Village Dr)	L	148.2	F		117.3	F		
	SB (Spring Village Dr)	T	121.2	F		86.5	F		
	SB (Spring Village Dr)	R	121.5	F		86.8	F		
	SB Overall (Spring Village Dr)		139.6	F	Fail	105.2	F	Fail	
	Overall		46.8	D	Pass	27.6	C	Pass	
20	Franconia-Springfield Parkway & I-95 HOT Lane Ramps (Signalized) ^a								
	EB (Franconia-Springfield Pkwy)	L (AM)	36.8	D		-	-		
	EB (Franconia-Springfield Pkwy)	T	10.9	B		25.7	C		
	EB (Franconia-Springfield Pkwy)	R (PM)	-	-		16.8	B		
	EB Overall (Franconia-Springfield Pkwy)		14.4	B	Pass	25.5	C	Pass	
	WB (Franconia-Springfield Pkwy)	L (PM)	-	-		35.2	D		
	WB (Franconia-Springfield Pkwy)	T	21.8	C		5.7	A		
	WB (Franconia-Springfield Pkwy)	R (AM)	17.4	B		-	-		
	WB Overall (Franconia-Springfield Pkwy)		21.2	C	Pass	7.6	A	Pass	
	NB (I-95 HOT Lane Off-ramp)	LTR (AM)	39.2	D		-	-		
	NB Overall (I-95 HOT Lane Off-ramp)		39.2	D		Pass	-		-
	SB (I-95 HOT Lane Off-ramp)	LTR (PM)	-	-		41.0	D		
	SB (I-95 HOT Lane Off-ramp)	R (PM)	-	-	40.1	D			
	SB Overall (I-95 HOT Lane Off-ramp)		-	-		40.6	D	Pass	
	Overall		17.5	B	Pass	15.8	B	Pass	

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour				
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check		
21	Franconia-Springfield Parkway/Manchester Boulevard & Beulah Street (Signalized)									
	EB (Franconia-Springfield Pkwy)	L	85.5	F		81.8	F			
	EB (Franconia-Springfield Pkwy)	T	36.3	D		65.6	E			
	EB (Franconia-Springfield Pkwy)	R	32.9	C		53.0	D			
	EB Overall (Franconia-Springfield Pkwy)		49.6	D	Pass	64.7	E	Fail		
	WB (Manchester Blvd)	L	77.7	E		112.4	F			
	WB (Manchester Blvd)	T	83.4	F		77.9	E			
	WB (Manchester Blvd)	R	37.7	D		36.7	D			
	WB Overall (Manchester Blvd)		76.8	E	Fail	76.5	E	Fail		
	NB (Beulah St)	L	168.3	F		214.3	F			
	NB (Beulah St)	T	65.8	E		78.2	E			
	NB (Beulah St)	R	48.1	D		63.0	E			
	NB Overall (Beulah St)		119.6	F	Fail	146.6	F	Fail		
	SB (Beulah St)	L	73.9	E		89.5	F			
	SB (Beulah St)	T	161.6	F		201.2	F			
	SB (Beulah St)	R	79.1	E		74.9	E			
	SB Overall (Beulah St)		114.8	F	Fail	137.8	F	Fail		
	Overall		84.1	F	Fail	96.9	F	Fail		
22	Franconia Road & Beulah Street (Signalized)									
	EB (Franconia Rd)	L	40.7	D		39.9	D			
	EB (Franconia Rd)	TR	49.6	D		60.2	E			
	EB Overall (Franconia Rd)		49.5	D		Pass	60.0		E	Fail
	WB (Franconia Rd)	L	64.3	E		100.1	F			
	WB (Franconia Rd)	TR	18.4	B		17.5	B			
	WB Overall (Franconia Rd)		39.4	D		Pass	49.3		D	Pass
	NB (Beulah St)	LT	51.5	D		60.6	E			
	NB (Beulah St)	R	28.1	C		23.3	C			
	NB Overall (Beulah St)		31.3	C		Pass	34.4		C	Pass
	SB (Driveway)	LTR	129.3	F		164.6	F			
	SB Overall (Driveway)		129.3	F		Fail	164.6		F	Fail
	Overall		39.9	D		Pass	51.1		D	Pass
23	I-95 NB On-ramp & Commerce Street (Signalized) ^b									
	EB (Commerce St)	L	-	-		1.8	A			
	EB (Commerce St)	T	-	-		0.1	A			
	EB Overall (Commerce St)		-	-		0.2	A			
	WB (Commerce St)	T	-	-		6.1	A			
	WB (Commerce St)	R	-	-		5.4	A			
	WB Overall (Commerce St)		-	-		5.9	A			
	Overall		-	-	-	2.8	A	Pass		

Table 4-19: No-build Condition for AM and PM Peak Hours (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
24	Frontier Drive Extension & Metro Station (Signalized)							
	WB (Metro Station)	L	31.3	C		23.4	C	
	WB Overall (Franconia-Springfield Access Rd)		31.3	C		23.4	C	
	NB (Frontier Dr Ext)	T	27.1	C		22.0	C	
	NB (Frontier Dr Ext)	R	30.1	C		19.4	B	
	NB Overall (Frontier Dr Ext)		29.2	C		22.0	C	
	SB (Frontier Dr Ext) to Driveway	L	23.6	C		21.2	C	
	SB (Frontier Dr Ext)	L	14.5	B		18.2	B	
	SB (Frontier Dr Ext)	T	0.1	A		0.0	A	
	SB Overall (Frontier Dr Ext)		14.3	B		16.0	B	
	Overall		16.4	B	Pass	18.7	B	Pass
25	Frontier Drive Extension & Metropolitan Center Drive Extension (TWSC)							
	EB (Metropolitan Center Dr Ext)	LR	14.8	B		13.3	B	
	EB Overall (Metropolitan Center Dr Ext)		14.8	B		13.3	B	
	NB (Frontier Dr Ext)	LT	4.3	A		1.4	A	
	NB Overall (Frontier Dr Ext)		2.1	-		0.5	-	
	Overall		2.1	-	Pass	4.7	-	Pass

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LOS = Level of Service

LTR = left / through / right lanes

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

Delay is Measured in Seconds Per Vehicle.

Red cells denote intersections operating at unacceptable conditions.

^a Intersection would operate with a different lane configuration during the AM and PM peak hours.

^b Intersection not analyzed during the AM peak hour.

4.7.6 No-build Condition Queuing Analysis

Synchro™ was used to calculate the 50th percentile queue lengths, and SimTraffic™ was used to calculate the 95th percentile queue lengths. The SimTraffic™ simulations have a statistical accuracy of plus or minus 4.5 percent error for the AM peak hour and 4.9 percent error for the PM peak hour simulations. Based on the Synchro™ and SimTraffic™ analysis, queue lengths exceeding the roadway storage capacity would occur at the following signalized intersection approaches (failing queue lengths). The lane group within the approach that would be operating under unacceptable conditions is noted in parentheses.

- Loisdale Road and Loisdale Court/Mall Access (Intersection #3)
 - Westbound Mall Access (right turns) during the AM peak hour
 - Eastbound Loisdale Court (left and right turns) and westbound Mall Access (right turns) during the PM peak hour

- Loisdale Road and Frontier Drive Extension (Intersection #8)
 - Northbound Loisdale Road (right turns) during the AM peak hour
- Loisdale Road and Hotel Entrance/Newington Road (Intersection #10)
 - Westbound Newington Road (right turns) during the PM peak hour
- Loisdale Road/I-95 (N) Ramp C & D and Fairfax County Parkway (Intersection #11)
 - Southbound Fairfax County Parkway (through movements) during the AM peak hour
- Frontier Drive and Best Buy/Springfield Mall Parking Lot Entrance (Intersection #14)
 - Westbound Best Buy entrance (left turns) during the AM peak hour
 - Eastbound Spring Mall Parking lot entrance (combined left, through and right movements) and northbound Frontier Drive (left turns) during the PM peak hour
- Frontier Drive and Home Depot/Springfield Mall Garage Entrance (Intersection #15)
 - Westbound Home Depot entrance (all movements) during the AM peak hour
- Frontier Drive and Franconia-Springfield Parkway (Westbound) (Intersection #17)
 - Southbound Frontier Drive (through movements) during the AM peak hour
- Frontier Drive and Franconia-Springfield Parkway (Eastbound) (Intersection #18)
 - Eastbound F-S Parkway (eastbound off ramp) (all movements) during the AM peak hour
 - Northbound Frontier Drive (right turns) during the PM peak hour
- Franconia-Springfield Parkway and Spring Village Drive/Bonniemill Lane (Intersection #19)
 - Eastbound F-S Parkway (through movements) and northbound Bonniemill Lane (right turns) during the AM peak hour
- Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street (Intersection #21)
 - Westbound Manchester Boulevard (left and through movements), northbound Beulah Street (left turns and through movements) and southbound Beulah Street (through and right movements) during the AM peak hour
 - Westbound Manchester Boulevard (left and through movements), northbound Beulah Street (left turns and through movements) and southbound Beulah Street (all movements) during the PM peak hour
- Franconia Road and Beulah Street (Intersection #22)
 - Westbound Franconia (left turns) and eastbound Franconia Road (combined through and right movements) during the PM peak hour
- Frontier Drive Extension and Metropolitan Center Drive (Intersection #25)
 - Eastbound Metropolitan Center Drive (combined left and right-turns) during the PM peak hour

Based on the analysis, the No-build Condition queue lengths for the unsignalized intersection approaches would be unacceptable (would fail at the 95th percentile) only at the intersection of Frontier Drive Extension and Metropolitan Center Drive Extension (all movements) during the PM peak hour. The remaining intersections in the study area would all have acceptable No-build Condition queue lengths.

4.7.6.1 Complete Intersection Queuing Analysis

This section summarizes the differences in queuing impacts between the No-build Condition and the Existing Condition by quantifying the change in intersection queuing failures. Following the summary, this section also includes the complete results of the queuing analysis in a table.

Based on the Synchro™ and SimTraffic™ analysis, 12 signalized intersections and one unsignalized intersection would experience queuing lengths that would exceed the available storage capacity. The remaining intersections in the study area would provide sufficient storage for the anticipated demand. Compared to the Existing Condition, the No-build Condition would have failing queues for three more intersections during the AM peak hour and four less intersections during the PM peak hour. In the AM peak hour in the Existing Condition, there would be 7

intersections with a failing queue approach compared with 10 in the No-build Condition, an increase of 3. In the PM peak hour in the Existing Condition, there would be 10 intersections with a failing queue approach compared with 6 in the No-build Condition, a decrease of 4.

Table 4-20 provides a summary of the number of intersections that meet the following criteria for approach lane groups in a queue that would change between the Existing Condition and the Comparable No-build Condition:

- **New Failing Movement**
 - Number of intersections that have a queuing problem in one or more movements that would **NOT** have a queuing problem in the previous condition
- **Additional Failing Movement**
 - Number of intersections that had at least one queuing movement failure in the previous condition and now would have additional/more queuing movement failures than before
- **No Change**
 - Number of intersections that would have no change in the number of queuing movement failures or the number of queuing movement failures would be the same as in the previous condition
- **Fewer Failing Movements**
 - Number of intersections that would have less queuing movement failures than in the previous condition, but still would have some failing movements
- **No Failing Movements**
 - Number of intersections that had queuing movement failures in the previous condition, but would no longer have queuing movement failures

Table 4-20: Queuing Summary Comparing Existing Condition to No-build Condition

Type of Change Between Conditions	AM	PM
New Failing Movement	4	0
Additional Failing Movement	3	2
No Change	14	15
Fewer Failing Movements	1	2
No Failing Movements	1	4
Total Signalized and Unsignalized Intersections	23	23

The results of the No-build Condition queuing analysis for both signalized and unsignalized intersections are presented in **table 4-21**. Note that the percentile values are expressed in feet, and a car occupies about 25 linear feet of roadway, including the space between cars.

Table 4-21: No-build Condition Queuing

#	Intersection	Lane Group	Turning Bay/Link Length (feet)	AM Peak Hour		PM Peak Hour	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
1	Loisdale Road/Commerce Street & Franconia Road (Westbound) (Signalized)						
	WB (Franconia Rd)	L	590	121	169	177	232
	WB (Franconia Rd)	T	1,100	305	331	261	288
	WB (Franconia Rd)	R	-	126	-	39	-
	NB (Commerce St)	L	69	2	12	12	42
	NB (Commerce St)	T	69	12	21	8	29
	SB (Commerce St)	T	595	108	150	273	306
	SB (Commerce St)	R	400	2	189	89	365
2	Loisdale Road/Commerce Street & Franconia Road (Eastbound) (Signalized)						
	EB (Franconia Rd)	L	300	110	156	72	127
	EB (Franconia Rd)	T	464	158	209	194	224
	EB (Franconia Rd)	R	300	0	71	0	136
	NB (Loisdale Rd)	T	1,093	199	187	313	506
	NB (Loisdale Rd)	R	550	0	133	0	158
	SB (Loisdale Rd)	L	69	6	29	0	21
	SB (Loisdale Rd)	T	69	6	26	0	40
3	Loisdale Road & Loisdale Court/Mall Access (Signalized)						
	EB (Loisdale Court)	L	200	40	63	160	#214
	EB (Loisdale Court)	LT	846	41	95	160	308
	EB (Loisdale Court)	R	75	0	61	12	#129
	WB (Mall Access)	L	147	9	30	80	122
	WB (Mall Access)	T	147	10	38	23	107
	WB (Mall Access)	R	30	0	#64	0	#60
	NB (Loisdale Rd)	L	225	11	70	19	123
	NB (Loisdale Rd)	T	729	57	84	156	185
	NB (Loisdale Rd)	R	400	0	-	0	9
	SB (Loisdale Rd)	L	600	6	46	58	129
	SB (Loisdale Rd)	T	1,455	56	81	218	1020
	SB (Loisdale Rd)	R	140	0	34	4	112

Table 4-21: No-build Condition Queuing (continued)

#	Intersection	Lane Group	Turning Bay/Link Length (feet)	AM Peak Hour		PM Peak Hour	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
4	Loisdale Road & Ramp from NB I-95/Spring Mall Drive (Signalized)						
	EB (Ramp from NB I-95)	L	425	120	167	101	143
	EB (Ramp from NB I-95)	T	823	136	173	105	155
	EB (Ramp from NB I-95)	R	325	0	53	0	22
	WB (Spring Mall Dr)	L	1,295	12	72	91	142
	WB (Spring Mall Dr)	R	2,390	85	133	63	171
	NB (Loisdale Rd)	TR	527	124	169	147	198
	NB (Loisdale Rd)	R	275	0	44	0	71
	SB (Loisdale Rd)	L	607	8	48	31	181
	SB (Loisdale Rd)	T	729	25	110	54	178
5	Loisdale Road & Metropolitan Center Drive (Signalized)						
	WB (Metropolitan Center Dr)	L	587	13	28	19	45
	WB (Metropolitan Center Dr)	R	587	0	52	0	39
	NB (Loisdale Rd)	T	598	50	89	38	62
	NB (Loisdale Rd)	R	170	0	16	0	15
	SB (Loisdale Rd)	L	270	1	48	0	78
	SB (Loisdale Rd)	T	527	4	119	0	64
6	Loisdale Road & Northern Entrance Road to GSA Facility (Access to Building A, 66808 & 6610 Loisdale Road) (TWSC)						
	WB (N Ent Rd to GSA)	L	592	-	4	-	11
	WB (N Ent Rd to GSA)	R	-	-	-	-	-
	NB (Loisdale Rd)	TR	812	-	0	-	-
	SB (Loisdale Rd)	L	594	-	40	-	-
7	Loisdale Road & Southern Entrance Road to GSA Facility (Access to Building B, 7000 Loisdale Road) (TWSC)						
	WB (S Ent Rd to GSA)	L	619	-	27	-	45
	WB (S Ent Rd to GSA)	R	619	-	50	-	53
	NB (Loisdale Rd)	TR	549	-	8	-	-
	SB (Loisdale Rd)	L	900	-	73	-	14
	SB (Loisdale Rd)	T	836	-	-	-	39

Table 4-21: No-build Condition Queuing (continued)

#	Intersection	Lane Group	Turning Bay/Link Length (feet)	AM Peak Hour		PM Peak Hour	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
8	Loisdale Road & Frontier Drive Extension (Signalized)						
	WB (Frontier Dr Ext)	L	518	18	48	164	236
	WB (Frontier Dr Ext)	R	518	0	18	0	43
	NB (Loisdale Rd)	T	2,409	201	261	159	219
	NB (Loisdale Rd)	R	100	29	#137	2	90
	SB (Loisdale Rd)	L	700	9	70	10	74
	SB (Loisdale Rd)	T	542	53	99	451	472
9	Loisdale Road & Lois Drive (TWSC)						
	WB (Lois Drive Dr)	LR	696	-	51	-	37
	NB (Loisdale Rd)	TR	1,594	-	6	-	13
	SB (Loisdale Rd)	L	1,000	-	19	-	25
	SB (Loisdale Rd)	T	2,409	-	9	-	12
10	Loisdale Road & Hotel Entrance/Newington Road (Signalized)						
	EB (Hotel Entrance)	LTR	422	7	50	5	67
	WB (Newington Rd)	LT	664	115	236	238	412
	WB (Newington Rd)	R	165	0	145	0	#203
	NB (Loisdale Rd)	L	200	2	13	23	63
	NB (Loisdale Rd)	T	573	63	112	43	64
	NB (Loisdale Rd)	R	365	3	94	0	59
	SB (Loisdale Rd)	L	500	29	103	123	180
	SB (Loisdale Rd)	T	566	21	53	208	244
	SB (Loisdale Rd)	R	450	0	7	0	20
11	Loisdale Road/I-95 (N) Ramp C & D & Fairfax County Parkway (Signalized)						
	EB (I-95 Northbound Off-Ramp)	T	409	198	304	51	105
	WB (Loisdale Rd)	L	378	93	153	234	241
	WB (Loisdale Rd)	R	378	146	164	432	#472
	NB (Fairfax County Pkwy)	T	619	453	427	860	#626
	NB (Fairfax County Pkwy)	R	300	75	259	21	274
	SB (Fairfax County Pkwy)	L	390	256	359	154	239
	SB (Fairfax County Pkwy)	T	628	1328	#684	535	400
	SB (Fairfax County Pkwy)	R	615	0	476	0	-

Table 4-21: No-build Condition Queuing (continued)

#	Intersection	Lane Group	Turning Bay/Link Length (feet)	AM Peak Hour		PM Peak Hour	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
12	Frontier Drive & Franconia Road (Westbound) (Signalized)						
	WB (Franconia Rd)	L	450	102	138	127	171
	WB (Franconia Rd)	T	774	406	363	284	233
	WB (Franconia Rd)	TR	580	406	499	284	349
	NB (Frontier Dr)	L	74	84	52	44	40
	NB (Frontier Dr)	T	74	3	17	4	20
	SB (Frontier Dr)	T	441	72	115	57	91
	SB (Frontier Dr)	TR	240	72	111	57	117
13	Frontier Drive & Franconia Road (Eastbound) (Signalized)						
	EB (Franconia Rd)	L	1,067	22	55	62	118
	EB (Franconia Rd)	T	1,067	118	173	219	248
	EB (Franconia Rd)	R	-	141	-	95	-
	NB (Frontier Dr)	T	831	336	822	322	556
	NB (Frontier Dr)	R	480	0	169	184	169
	SB (Frontier Dr)	LT	74	7	28	8	31
14	Frontier Drive & Best Buy/Springfield Mall Parking Lot Entrance (Signalized)						
	EB (Springfield Mall Lot Ent)	L	199	13	26	143	132
	EB (Springfield Mall Lot Ent)	LTR	199	8	58	63	#238
	WB (Best Buy Ent)	L	207	~61	110	104	164
	WB (Best Buy Ent)	TR	207	4	47	14	119
	NB (Frontier Dr)	L	190	36	88	135	#212
	NB (Frontier Dr)	T	562	463	220	98	170
	NB (Frontier Dr)	R	500	2	26	0	40
	SB (Frontier Dr)	L	240	53	101	93	182
	SB (Frontier Dr)	T	939	204	113	158	192
	SB (Frontier Dr)	R	300	0	28	62	63
15	Frontier Drive & Home Depot/Springfield Mall Garage Entrance (Signalized)						
	EB (Springfield Mall Garage Ent)	LT	166	2	15	20	56
	EB (Springfield Mall Garage Ent)	R	100	0	-	0	18
	WB (Home Depot Ent)	LTR	256	~89	182	53	269
	NB (Frontier Dr)	L	190	8	26	20	55
	NB (Frontier Dr)	T	469	155	151	69	117
	NB (Frontier Dr)	R	300	1	30	0	25
	SB (Frontier Dr)	L	310	114	163	176	239
	SB (Frontier Dr)	T	562	35	57	83	110
	SB (Frontier Dr)	R	-	0	-	0	-

Table 4-21: No-build Condition Queuing (continued)

#	Intersection	Lane Group	Turning Bay/Link Length (feet)	AM Peak Hour		PM Peak Hour	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
16	Frontier Drive & Spring Mall Drive (Signalized)						
	EB (Spring Mall Dr)	L	215	47	70	81	76
	EB (Spring Mall Dr)	LT	2,390	48	114	84	164
	EB (Spring Mall Dr)	R	1,338	0	282	190	488
	WB (Spring Mall Dr)	LT	218	23	45	148	205
	WB (Spring Mall Dr)	R	218	0	35	0	105
	NB (Frontier Dr)	L	325	193	198	238	268
	NB (Frontier Dr)	T	717	235	261	311	431
	NB (Frontier Dr)	R	275	0	42	9	104
	SB (Frontier Dr)	L	200	19	50	29	81
	SB (Frontier Dr)	T	469	49	236	147	247
	SB (Frontier Dr)	R	225	0	93	6	198
17	Frontier Drive & Franconia-Springfield Parkway (Westbound) (Signalized)						
	WB (F-S Pkwy WB Off-ramp)	L	460	34	66	35	90
	WB (F-S Pkwy WB Off-ramp)	LT	792	34	88	34	71
	WB (F-S Pkwy WB Off-ramp)	R	450	0	33	0	207
	NB (Frontier Dr)	L	264	0	-	1	8
	NB (Frontier Dr)	T	262	14	47	22	42
	SB (Frontier Dr)	T	622	269	#738	155	231
	SB (Frontier Dr)	R	375	59	325	218	318
18	Frontier Drive & Franconia-Springfield Parkway (Eastbound) (Signalized)						
	EB (F-S Pkwy EB Off-ramp)	L	948	168	#1264	196	222
	EB (F-S Pkwy EB Off-ramp)	LT	948	169	#969	198	194
	EB (F-S Pkwy EB Off-ramp)	R	430	~607	#455	0	96
	NB (Frontier Dr)	T	320	17	52	101	139
	NB (Frontier Dr)	R	115	0	20	0	#128
	SB (Frontier Dr)	L	262	3	30	15	31
	SB (Frontier Dr)	T	262	65	81	4	22

Table 4-21: No-build Condition Queuing (continued)

#	Intersection	Lane Group	Turning Bay/Link Length (feet)	AM Peak Hour		PM Peak Hour	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
19	Franconia-Springfield Parkway & Spring Village Drive/Bonniemill Lane (Signalized)						
	EB (Franconia-Springfield Pkwy)	L	520	74	302	38	77
	EB (Franconia-Springfield Pkwy)	T	1,063	~2874	#1320	306	266
	EB (Franconia-Springfield Pkwy)	R	395	0	118	0	10
	WB (Franconia-Springfield Pkwy)	L	415	108	150	203	241
	WB (Franconia-Springfield Pkwy)	T	2,515	183	143	1097	409
	WB (Franconia-Springfield Pkwy)	R	410	0	39	6	101
	NB (Bonniemill Ln)	L	160	37	46	13	33
	NB (Bonniemill Ln)	T	160	6	17	3	12
	NB (Bonniemill Ln)	R	160	296	#178	0	50
	SB (Spring Village Dr)	L	250	220	248	185	220
	SB (Spring Village Dr)	T	830	6	93	9	49
	SB (Spring Village Dr)	R	250	0	37	0	129
20	Franconia-Springfield Parkway & I-95 HOT Lane Ramps (Signalized)						
	EB (Franconia-Springfield Pkwy)	L (AM)	640	110	216	-	-
	EB (Franconia-Springfield Pkwy)	T	864	330	250	254	325
	EB (Franconia-Springfield Pkwy)	R (PM)	-	-	-	0	-
	WB (Franconia-Springfield Pkwy)	L (PM)	425	-	-	84	129
	WB (Franconia-Springfield Pkwy)	T	1,039	193	233	208	254
	WB (Franconia-Springfield Pkwy)	R (AM)	-	0	-	-	-
	NB (I-95 HOT Lane Off-ramp)	(AM)	936	67	233	-	-
	SB (I-95 HOT Lane Off-ramp)	(PM)	1,071	-	-	0	249
	SB (I-95 HOT Lane Off-ramp)	R (PM)	1,071	-	-	0	216
21	Franconia-Springfield Parkway/Manchester Boulevard & Beulah Street (Signalized)						
	EB (Franconia-Springfield Pkwy)	L	610	320	342	261	338
	EB (Franconia-Springfield Pkwy)	T	4,336	390	349	912	675
	EB (Franconia-Springfield Pkwy)	R	4,336	51	172	470	484
	WB (Manchester Blvd)	L	375	91	#430	182	#487
	WB (Manchester Blvd)	T	813	~695	734	825	#842
	WB (Manchester Blvd)	R	575	0	327	0	528
	NB (Beulah St)	L	500	~574	#532	~542	#565
	NB (Beulah St)	T	1,016	358	#1198	294	#1354
	NB (Beulah St)	R	315	0	197	0	189
	SB (Beulah St)	L	380	65	134	217	#404
	SB (Beulah St)	T	942	~219	333	~466	#755
	SB (Beulah St)	R	235	66	#238	97	#374

Table 4-21: No-build Condition Queuing (continued)

#	Intersection	Lane Group	Turning Bay/Link Length (feet)	AM Peak Hour		PM Peak Hour	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
22 Franconia Road & Beulah Street (Signalized)							
	EB (Franconia Rd)	L	190	2	43	3	66
	EB (Franconia Rd)	TR	6,354	264	238	~460	391
	WB (Franconia Rd)	L	350	573	#426	~761	#427
	WB (Franconia Rd)	TR	965	114	386	197	689
	NB (Beulah St)	LT	659	114	167	207	265
	NB (Beulah St)	R	659	490	405	257	255
	SB (Driveway)	LTR	249	6	28	40	89
23 I-95 NB On-ramp & Commerce Street (Signalized) ^a							
	EB (Commerce St)	L	515	-	-	1	67
	EB (Commerce St)	T	-	-	-	0	-
	WB (Commerce St)	T	364	-	-	48	109
	WB (Commerce St)	R	364	-	-	0	88
24 Frontier Drive Extension & Metro Station (Signalized)							
	WB (Metro Station)	L	401	2	20	46	104
	NB (Frontier Dr Extension)	T	217	17	69	60	113
	NB (Frontier Dr Extension)	R	140	51	124	0	19
	SB (Frontier Dr Extension) to Driveway	L	300	238	177	86	189
	SB (Frontier Dr Extension)	L	300	98	135	40	120
	SB (Frontier Dr Extension)	T	-	0	-	0	-
25 Frontier Drive Extension & Metropolitan Center Drive Extension (TWSC)							
	EB (Metropolitan Center Dr Extension)	LR	78	-	56	-	#82
	NB (Frontier Drive Extension)	LT	934	-	47	-	17
	NB (Frontier Drive Extension)	T	934	-	-	-	8
	SB (Frontier Drive Extension)	TR	150	-	12	-	2

Notes:

~ 50th percentile volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal. Due to upstream metering, the 95th percentile queue may be less than the 50th percentile queue.

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left / through / right lanes

TWSC = Two-way STOP-Controlled unsignalized intersection

Red cells denote approaches and lane groups whose queuing length exceeds capacity.

^a Intersection not analyzed during the AM peak hour.

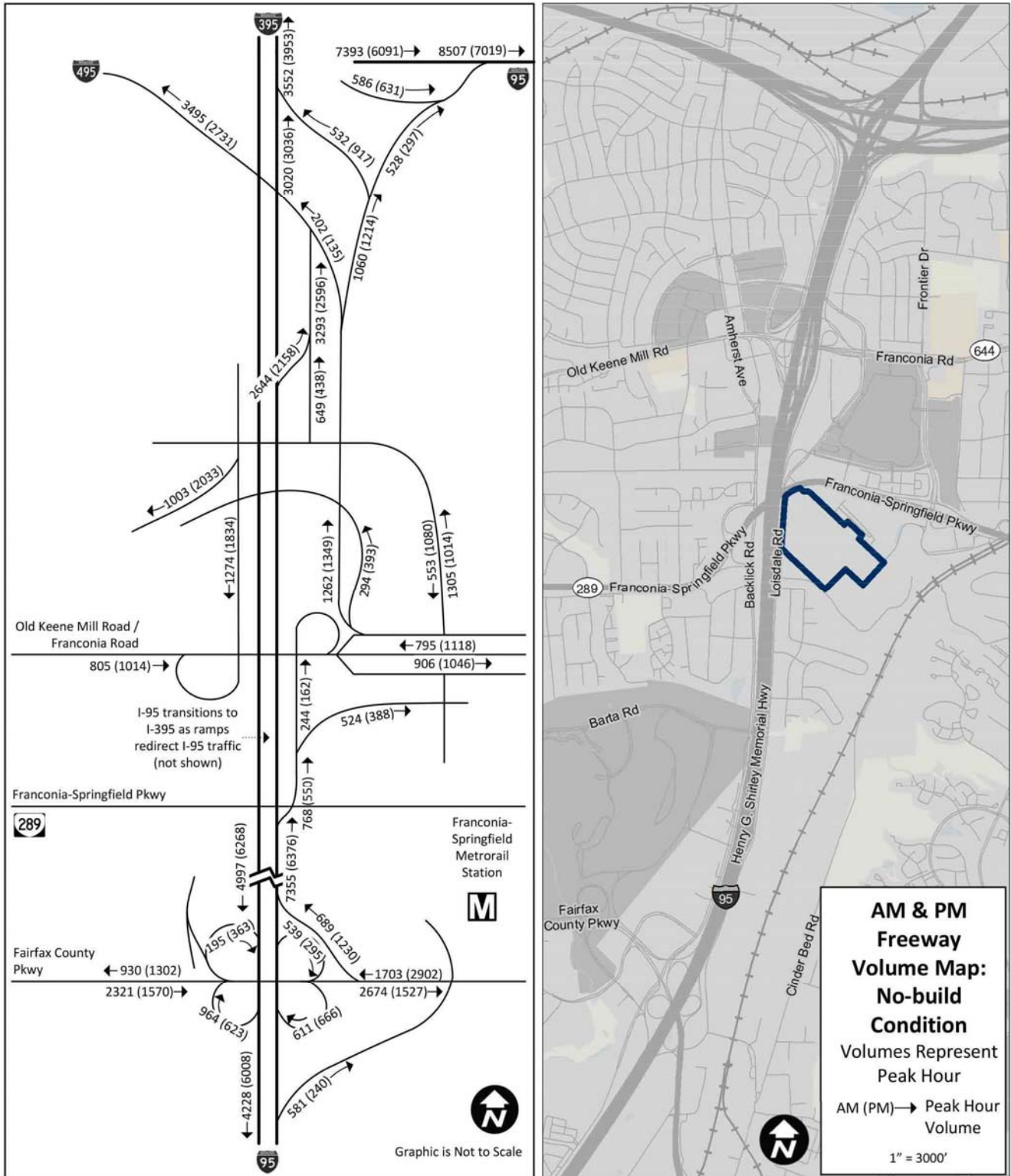
4.7.6.2 Overall Traffic Impact Assessment

Overall, there would be impacts during the AM and PM peak hour at the Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street intersection (Intersection #21) resulting in direct, long-term, adverse impacts due to the isolated nature of the impacts.

4.7.7 No-build Condition Freeway Volumes

Although freeway analysis was not performed for the No-build Condition, freeway ramp volumes are included in [figure 4-12](#) to allow a comparison to the Existing Condition, Build Condition, and Build with Mitigation Condition freeway ramp volumes presented in [Sections 3.7, 5.8, and 6.6](#), respectively. Full analysis of the freeway volumes is included in the Build with Mitigation Condition in [Section 6.6](#).

Figure 4-12: No-build Condition Freeway Volumes



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5.0 Analysis of Build Condition

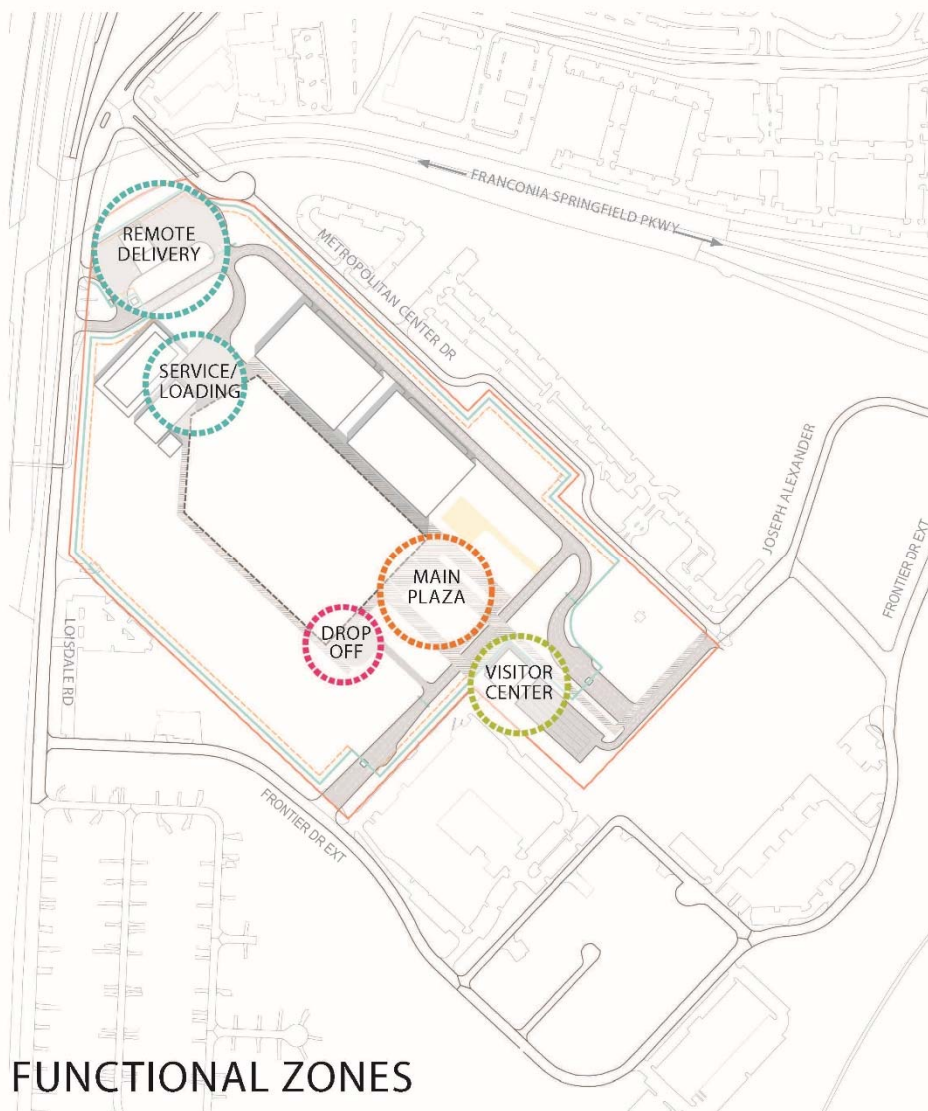
This chapter introduces the Build Condition for the Springfield site and summarizes the potential impact on the pedestrian network, bicycle network, public transit system, parking conditions, truck access, and traffic operations from the consolidation of the FBI HQ on the Springfield site.

Under the Build Condition, GSA would not continue to maintain the FBI HQ building in Washington, D.C., and the Springfield site would be selected. The Springfield Build Condition is unique from the proposed action described in the FBI HQ Consolidation DEIS because it only analyzes the conditions at the Springfield site and does not factor in the impacts from the exchange of the JEH parcel in Washington, D.C.

5.1 Description of Build Condition

Consolidation of the FBI HQ at Springfield would include a Main Building or series of buildings of approximately 2.4 million GSF. The main HQ building would house the majority of the approximately 11,000 employees, plus approximately 400 non-seated contractors, such as custodial staff and food service workers. The Main Building would include a variety of spaces, including general office space, collaborative workspaces, the Mission Briefing Center and auditorium (to be used for training and large meetings), a cafeteria/food court, retail spaces, fitness center, credit union, and medical clinic. The building(s) also would include support spaces such as loading docks, workshops, and police/security spaces. In addition to the Main Building, the site would also contain plaza areas, parking areas, a Central Utility Plant (CUP), a Remote Delivery Facility (RDF) and truck access, a Visitor Center (VC), and gate and access points. The location of some of these elements is shown in [figure 5-1](#).

Figure 5-1: Springfield Site Organization



The remote delivery zone, which would contain a truck-only gate, truck screening facility, and the RDF, would be located in the northwestern portion of the site, with trucks accessing the site from Loisdale Road through the truck gate on the north side of the site. The truck gate would only allow vehicles to enter and exit during non-peak periods, and would be located off of Loisdale Road to prevent trucks from using local neighborhood roads to access the site. Adjacent to this zone would be the service and loading zone, southeast of the remote delivery zone and adjacent to the northern end of the Main Building. This zone would contain the CUP and stand-by generators; a substation would not be necessary at this site. Access to the Main Building for loading and maintenance also would occur in this zone. The 9.28-acre developable area for the Main Building would be located in the center of the site. Based on the size and configuration of the developable area, the planning team determined that the Main Building would be up to 12 stories. The developable area in front of the Main Building would form the plaza zone. This zone would be oriented toward the VC and the Franconia-Springfield Metro Station, on the opposite end of the Main Building developable area from the service and loading zone. This zone would provide a pedestrian-oriented open space for employees and visitors, as well as a stage for a grand

entrance to the Main Building. The visitor zone would be located along the southeastern site boundary in between Frontier Drive Extension (formerly Springfield Center Drive) and Metropolitan Center Drive. This zone would contain the VC, visitor parking, and bus drop-off. The visitor parking lot would accommodate up to 145 spaces. A secondary vehicular entrance would be located within the visitor zone, while the main vehicular gate would be located to the south and west of the visitor zone.

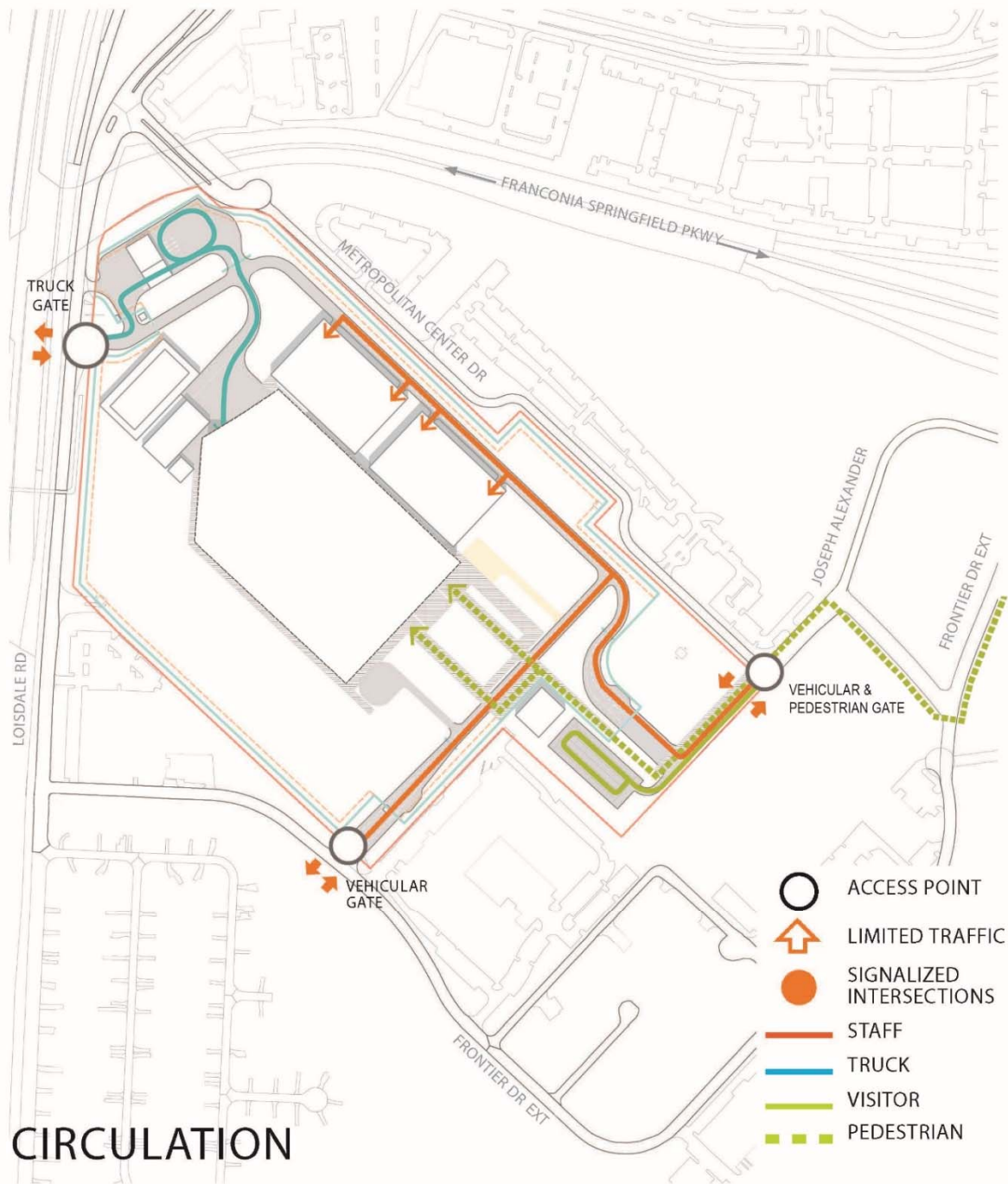
Access to the site would be primarily provided along Frontier Drive Extension (formerly Springfield Center Drive), as shown in [figure 5-2](#). The preliminary conceptual site plan (a plan developed prior to studying the internal and external transportation impacts) contains two vehicular entry control facilities (ECFs): Note that other resources topics in the EIS based their impact assessment on the revised conceptual site plan describe in the Build with Mitigation ([Section 6](#)).

- **West Access:** This ECF, located along Loisdale Road, would contain one lane for inbound and one lane for outbound truck traffic during non-peak hours only. No employee vehicular traffic would be allowed through this gate.
- **South Access:** This ECF, located along Frontier Drive Extension, would contain a total of four lanes for employee vehicular traffic. Employee vehicles would enter the site through two inbound lanes and exit the site through two outbound lanes.
- **East Access:** This ECF, located along Metropolitan Center Drive, would contain a total of three lanes for employee vehicular traffic only. Employee vehicles would enter the site through two inbound lanes and would exit the site through one outbound lane.

Visitor vehicular traffic as well as visitor and employee pedestrian traffic would access the site through the vehicular and pedestrian gate located on the west side of the site off of Metropolitan Center Drive, adjacent to the visitor parking lot. This pedestrian entrance point is closest to the Franconia-Springfield Metro Station, which provides access to Metrorail, VRE, and buses.

Employee parking garages would be located to the north and east of the Main Building developable area along the northeastern site boundary, adjacent to Metropolitan Center Drive. In the conceptual site layout analyzed in the EIS, these spaces would be accommodated in two, eight-story parking structures. The FBI is conducting an internal analysis to support a final determination of the total amount of employee parking for this site. The final number and layout of the parking structures to accommodate the required employee and fleet vehicle parking would be determined during the design process.

Figure 5-2: Preliminary Springfield Site Circulation



- The key components of the Springfield Build Condition are as follows: Sidewalk improvements along the eastern corner of the Springfield site would be built to connect the onsite sidewalks to the offsite pedestrian network. ADA accessibility and pedestrian access improvements would be made as needed at remaining entry locations.
- No offsite bicycle improvements are included as part of the Build Condition. Bicycle improvements such as bicycle parking and showers or locker rooms may be provided as part of the final design, but are not yet known at this time.
- No shuttle service is proposed as part of the Build Condition, because the Springfield site is within a 0.5-mile walk of the nearest transit station.
- All parking supporting the Build Condition would be accommodated onsite. In the conceptual site layout analyzed in the EIS, these spaces would be accommodated in two, eight-story parking structures.
- Truck access would be provided at the West Access ECF; trucks would be required to access the facility at off-peak hours.
- Three entry driveways leading to ECF facilities would be developed as part of the site. These include a West Access along Loisdale Road (one-lane entry, one-lane exit, truck access only), a South Access along Frontier Drive Extension (five-lane entry, two-lane exit), and an East Access to/from Metropolitan Center Drive (two-lane entry, one-lane exit).

The Springfield Build Condition includes the following transportation improvements that would be necessary for the site to function based on the magnitude of trips forecasted. These improvements are mitigation measures, discussed in [Section 6](#), but they are also included in the Build Condition to accommodate trip volumes.

- Frontier Drive Extension and Site South Access: A traffic signal would be installed and a three-lane approach exiting the Springfield site with two right-turn lanes and one left-turn lane would be created.
- Frontier Drive Extension and Metropolitan Center Drive: A traffic signal would be installed and a three-lane eastbound approach from Metropolitan Center Drive, including two left-turn lanes and one right-turn lane, would be created.

The trip generation and modal split assumptions are discussed first, followed by a discussion for each transportation mode.

5.2 Trip Generation and Mode Split

This section covers the trip generation and modal split process and methods used to develop the Build Condition transit and traffic trip volumes.

5.2.1 Trip Generation

The process of trip generation calculation is based on forecasting the number of AM and PM peak hour trips generated by the proposed development. There are several proposed trip generators for the site including an estimated 11,055 FBI employees, a 500-seat Mission Briefing Center, and a fleet of pool cars, according to the FBI. Based on an estimate for commuter-based pool car use, there would be less than five trips produced. It is also assumed that the approximately 400 non-seated contractors providing custodial, food, fitness center, health, and other services would travel outside the peak hours. Therefore, no trips were added to the trip generation calculation for commuter-based pool car use or non-seated contractors. The process for forecasting the FBI employee and Mission Briefing trips is discussed next.

5.2.1.1 *FBI Employee Person Trips*

Many employees choose to or are scheduled to begin or end work earlier or later than the peak hours to avoid traffic, to schedule shared childcare responsibilities, to take advantage of quiet time at work, and for other reasons. The *ITE Trip Generation Manual, 9th Edition*, identifies estimates for peak hour trip generation rates for different types of office buildings based on various studies; however, most of these studies are in suburban rather than urban environments, “having little or no transit service, nearby pedestrian amenities, or travel demand management (TDM) programs” (ITE 2012). In addition, FBI employee patterns of arrivals and departures, including the number of employees who will be off-site or on field work at any given time is not typical of most office uses. For these reasons, it was determined that the future FBI trip generation rate is not accurately represented by the *ITE Trip Generation Manual*; therefore, a special study was undertaken to determine appropriate trip generation rates using the current FBI HQ, which houses more than 50 percent of staff. As stated in the *Trip Generation Manual*, “when practical, the user is encouraged to supplement the data in this document with local data that have been collected at similar sites” (ITE 2012).

Morning peak hour rates were calculated based on FBI turnstile counts obtained from the FBI representing all persons entering the JEH building (current FBI HQ). Following the guidance of the *ITE Trip Generation Handbook, 2nd edition* (ITE 2004), three days of turnstile counts (November 12, 2013 [Tuesday], December 4, 2013 [Wednesday], and January 9, 2014 [Thursday]) were obtained. The sample days for normal operations days were selected by the FBI. The survey results produced a peak hour count of 1,344 on November 12, 2013, 1,361 on December 4, 2013, and 1,324 on January 9, 2014, and a peak hour of 7:15 AM to 8:15 AM. To provide a more conservative forecast, the maximum count from the 3-day turnstile counts (1,361) was used, instead of the average. The turnstile counts only represent the inbound flows, but most organizations have two-way flows of workers, even in peak hours. Therefore the *ITE Trip Generation Manual Corporate Headquarters land use entering/exiting percentages* (AM: 93 percent entering / 7 percent exiting) were used to calculate the morning outbound peak hour flow, based on the maximum count from the survey results. The total person trips (entering and exiting) divided by 5,045 (current number of FBI employees working at the JEH building) was used to develop the AM peak hour rate, which resulted in a 0.29 person trip rate (29.0 percent of employees arrive or leave during the AM peak hour).

Afternoon peak hour rates were calculated based on a JEH building exit-only trip generation survey. Following the ITE guidance (ITE 2004), the trip generation survey was conducted for three days (September 16, 17, and 18, 2014) on a non-holiday week resulting in outgoing trip volumes of 1,174, 1,259, and 1,130, respectively. Based on the PM peak hour occurring between 4:30 PM and 5:30 PM, the PM rate was calculated from the trip generation survey (outbound flow) and the inbound turnstile counts from the inbound survey days.

Based on the turnstile volumes, the highest number of employees entering during the 4:30 to 5:30 PM time slot was 114. The average for the time slot was 73, higher than both the other days' values (68 and 36 respectively) for the same one-hour period. This meant that the 114 value was skewing the values when averaged and was not a good representation of a typical evening inbound flow. Therefore, the next 15-minute slot for an hourly average (4:45 PM-5:45 PM) was examined. The average of the 4:45 PM to 5:45 PM time slot equals the average of the 3 days for the 4:30 to 5:30 PM time slot, and therefore appears to be more typical of a normal operation. To follow the same process as the inbound flow, the highest value of this time slot was used, for a value of 98. Since the values for the inbound PM flows fluctuated between days and one day seemed to at least double the other two, the percent entering and exiting was adjusted to model the outbound flows in a more conservative manner. The calculated split was 7 percent inbound and 93 percent outbound. Instead the split was rounded down and up to a 5 percent inbound and 95 percent outbound split. The outbound split has the greatest impact on traffic; therefore a higher outbound split percentage is more conservative (worse case) than a lower outbound split.

This resulted in a 0.269 person PM peak hour trip rate (26.9 percent of employees arrive or leave during the PM peak hour) where 5 percent entered and 95 percent exited the JEH building based on the 5,045 existing employees working at the JEH building. [Table 5-1](#) summarizes the JEH building trip generation rates.

Table 5-1: J. Edgar Hoover Building Existing Peak Hour Person Trips

Source	Independent Variable	Time Period	IN	OUT	TOTAL
Turnstiles (11/12/13, 12/4/13, and 1/9/14) Survey (9/16/14 - 9/18/14)	5,045 employees	AM Peak Hour	1,361	102	1,463
		PM Peak Hour	98	1,259	1,357
Existing number of employees at JEH building			5,045		
AM peak hour trip generation rate			0.290		
PM peak hour trip generation rate			0.269		

5.2.1.2 Mission Briefing Center

The Briefing Center is assumed to have 500 seats, according to the FBI. It is assumed that half (50 percent) of the facility capacity would arrive from offsite and that half would be onsite (walk) trips. The ITE *Trip Generation Manual* does not contain a “Conference Center” land use; therefore, the study followed the trip rates used by the traffic study for the Washington Convention Center published in the Old Post Office (OPO) Redevelopment Transportation Study (GSA in cooperation with NCPC 2013). The AM peak inbound trip generation rate reported by the OPO study was 0.36; the PM peak outbound trip rate was 0.29, assuming that 100 percent would be inbound in the AM peak and 100 percent outbound in the PM peak.

5.2.1.3 Total Site Forecasted Person Trips

The person trip generation representing the total number of estimated employees at the new site used the trip rates calculated through the JEH building trip generation study. The Mission Briefing Center uses the person trip generation rates provided by the OPO Redevelopment Transportation Study. [Table 5-2](#) contains the Landover site forecasted person trip generation and trip generation assumptions.

Table 5-2: Landover Site Forecasted Trip Generation

Future FBI Person Trips	Time Period	Enter/Exit Percentages		Proportion of Trips during the Peak Hour	Future Employee Person Trips		
		IN	OUT		IN	OUT	TOTAL
Employees (based on JEH Turnstile Counts and Surveys)							
11,055	AM Peak Hour	93%	7%	29%	2,982	224	3,206
	PM Peak Hour	5%	95%	26.9%	149	2,825	2,974
Briefing Center (based on the Old Post Office Redevelopment Transportation Study)							
250	AM Peak Hour	100%	--	36%	90	--	90
	PM Peak Hour	--	100%	29%	--	73	73
Total People							
11,305	AM Peak Hour	--	--	--	3,072	224	3,296
	PM Peak Hour	--	--	--	149	2,898	3,046

5.2.2 Modal Split

Modal split is calculated by apportioning person trips to the available transportation modes used to commute. The process begins with calculating the split for carpools/vanpools, followed by single-occupancy vehicles (SOV), and then works systematically through the other modes. Employees and the Mission Briefing visitors are evaluated separately.

5.2.2.1 Employee Mode Split

Carpool/Vanpool: The number of vehicles is highly dependent on the number of parking spaces available. According to the NCPC Comprehensive Plan Transportation Element (NCPC 2004), the number of parking spaces for a suburban site within 2,000 feet of a Metrorail station is determined by a ratio of one parking space for every three employees, a ratio of 1:3. Because the site is projected to have 11,055 employees, the number of parking spaces is therefore assumed to be 3,685. ***It should be noted that this number does not reflect the non-seated workers, visitors, and pool fleet, which will require additional parking spaces and will not be subject to NCPC parking policy.*** Based on information from NCPC and consultant knowledge of carpool/vanpool mode split at other large Federal sites, the carpool/vanpool mode split was initially estimated at approximately 8 percent. Given the significant slugging (casual carpool) population in the I-95 corridor; limited parking at the site and at suburban Metro stations; long trip times when driving, parking, and using Metrorail; vanpool incentive programs and dedicated vanpool and carpool parking at the site; the high percentage of Federal employees living south of the site along the I-95 corridor; and that onsite Transportation Demand Management programs would likely include a ride-matching program customized for FBI employees, it is reasonable to assume that 11 percent (1,216) of FBI employees at this site would take advantage of carpools/vanpools. This is slightly lower than the MWCOG model projection (MWCOG 2014) for this site in 2020 (12.4 percent), but consistent with several existing Federal sites in the region. Based on the Springfield Site Transportation Agreement, the average vehicle occupancy would be four persons resulting in 304 vehicle trips and by extension 304 removed and potentially reserved parking spaces for carpools/ vanpools.

Single-Occupancy Vehicles: After 304 spaces are removed for carpool/vanpools, 3,381 spaces remain for SOV use, a 30.58 percent mode share. It is assumed that the FBI and GSA, through the application of a Transportation Management Plan, would implement policies and actions to deter any nearby on-street parking and offsite parking using the Franconia-Springfield Metro Station parking facilities. This can be accomplished through aggressive monitoring and punitive actions.

Bicycle: As noted in the Existing Condition section, a variety of multi-use paths and on-road bicycle accommodations are available in the study area. Although the land surrounding the site is characterized by low-density single-family housing, given the moderately dense multi-family residential, educational and retail uses nearby, some bicycle accommodations, and the nature of the roadway network surrounding the site, it is expected that approximately 2 percent, or 221 employees, would bicycle to the site, which is consistent with the NCPC 2011 forecast for Federal Employee Commuting Patterns (2008) (NCPC 2011) and the MWCOG 2013 *State of the Commute* (MWCOG 2011).

Walk: Although the land use surrounding the site is characterized by low-density single-family residential, given the limited supply of onsite parking, the mixed-use and moderately dense and fairly walkable residential, educational and retail land uses nearby, and the nearby network of multi-use paths, it is expected that approximately 3 percent, or 332 employees, would walk to the site. This would include employees who may choose to drive and then walk from adjacent paid parking facilities. This is consistent with the NCPC 2011 forecast for Federal Employee Commuting Patterns (2008) (NCPC 2011).

Commuter Bus: As noted in the Existing Condition section, there is currently one regional bus route (PRTC) serving the Franconia-Springfield Metro Station. It is likely that in the future three commuter bus providers would

service the Springfield site: PRTC as well as Loudoun County Transit and Martz that are currently providing service along the I-95 corridor to the DC core. Given the proximity of the site to the Beltway and I-95, the availability of HOV/HOT lanes, and the anticipated demand for this service from 11,055 employees in a single location, commuter bus service is well suited for this location. This mode is particularly effective for long-distance commuters in the region as commuter buses typically pick up at a Park & Ride in the early AM and drop riders at or near their place of employment. It is expected that commuter bus providers would implement new services to meet the demand of employees commuting to this site providing service from park and ride locations throughout Northern Virginia directly to the site and/or the adjacent Metrorail station. Given the site location in proximity to the large Federal workforce in Northern Virginia and in particular along I-95 to the south of the site, freeway access to the site, and existing commuter bus services in the corridor, a 10 percent (1,105) mode share for commuter bus is assumed, generating 37 vehicle trips.

Local Bus: As noted in the Existing Condition section, there are both local buses and circulator buses operating near the site, connecting the Franconia-Springfield Metro Station to communities throughout Fairfax County, as well as providing connections between Metro and VRE stations. There are 19 local bus routes (14 Fairfax County, 5 Metrobus) serving the Franconia-Springfield Metro Station. (PRTC also has a route serving the station, as described in the *Commuter Bus* section.) Two of these local buses also directly serve the southwest side of the project site. Not including Franconia-Springfield, these buses serve three Metrorail stations and two VRE stations in total, including as far north as Dunn Loring. As such, the capture area for local bus for this suburban site is quite large. However, this is offset by infrequent headways, long distances, and the long travel times potential employees would experience using these services.

In general, these routes serve suburban areas. Higher density areas in Arlington County and the City of Alexandria are accessible via Metrorail, so FBI employees living in those areas are not likely to use multiple local bus trips to access the site. However, with limited onsite parking availability, some employees would choose to drive and then walk or take local bus from adjacent paid parking facilities to the Franconia-Springfield Metro Station to catch the shuttle. As a result 6 percent, or 663 employees, was selected as the local bus mode split for this site to incorporate employees who drive to a location near the site then use local bus for the final leg as well as employees using only local bus service.

Metro/VRE: Once the data points and assumptions for other modes were applied and the number of employees assigned to each was calculated, it is assumed that the remaining employees will travel to/from the site via Metro or VRE via the Springfield Franconia Metro station which is approximately 0.5 miles one way by roadway. When all other modes are combined they equate to 6,918 trips, leaving 4,137 trips, or 37.42 percent of the total trips, that would use Metro or VRE and walk or take a shuttle to the site. The results of the 2013 Mark Center Transportation/Commuter Survey Report (Washington Headquarters Services 2012) showed 48 percent of employees used public transit in 2013, a trip that requires transferring to a bus at either the Pentagon Metro Station or King Street Metro Station to reach the Mark Center site. These results are relevant because it is a large federal worksite with limited onsite parking and illustrates that a large percentage of employees will utilize transit when parking is not available. This is higher than the 33 percent reported by NCPC for Federal Employees region-wide. However, it is reasonable given the expected parking ratio of 1:3 (one space for every three employees) resulting in only 3,442 SOV parking spaces for 11,055 employees and the proximity of the site to the Springfield-Franconia Metro Station and VRE station.

Table 5-3 summarizes the relevant modal split information sources and percentages referenced in the discussion above.

Table 5-3: Modal Split Summary of Sources

Mode	MWCOG 2020 Percent by Mode for TAZ 2025 ^a	MWCOG 2013 State of the Commute ^b	2011 NCPC ^c Federal Employee Commuting Patterns (2008)
Single-Occupancy Vehicles (SOV)	76.5%	71.5%	54%
Carpool/ Vanpool	12.4%	7.3%	8%
Bicycle	NA	2.4%	2%
Walk	0.1%		3%
Commuter Bus	NA	NA	NA
Local Bus	5.3%	18.8%	33%
Metrorail/ Commuter Rail	5.7%		
Telework/ Compressed Work Schedules	NA	NA	NA
Total	99.1%	100%	100%

NA = Not Applicable. Percentages do not always equal 100 percent due to unreported modes and/or rounding.

^a Represents the forecasted 2020 modal split based on a forecast of more than 2,100 total jobs within the MWCOG travel demand model traffic analysis zone (TAZ) 1113 located at the proposed site (MWCOG 2014)

^b MWCOG (2011)

^c NCPC (2012)

Table 5-4 summarizes the FBI mode split, as discussed above, and provides the resulting trips by mode.

Table 5-4: FBI Modal Split Summary

Mode	FBI Development Percent by Mode	FBI Number of trips by Mode
Single-Occupancy Vehicles	30.58%	3,381
Carpool/ Vanpool ^a	11%	304 trips (1,216 persons)
Bicycle	2%	221
Walk	3%	332
Commuter Bus ^b	10%	37 trips (1,105 persons)
Local Bus	6%	663
Metrorail/ Commuter Rail	37.42%	4,137
Telework/ Compressed Work Schedules	0%	0
Total	100%	11,055

^a Assumes an average occupancy of four persons per carpool/vanpool

^b Assumes an average of 30 persons per commuter bus; 1,105 people equates to 37 buses

5.3 Pedestrian Network

Under the Build Condition, sidewalk improvements along the eastern corner of the Springfield site would be built to connect the onsite sidewalks and pedestrian access gate area to the offsite pedestrian network. Because the roadways adjacent to the Springfield site already have sidewalks on at least one side of the road, or would have sidewalks as roadways are constructed for the No-build Condition (e.g., Frontier Drive Extension and Metropolitan Center Drive Extension), only localized pedestrian improvements are anticipated at the locations of the remaining ECFs to provide ADA compliance and pedestrian access, as needed. Within the site, multiple pedestrian pathways would provide access to the Main Building and between elements on the site; the exact location of these pedestrian accommodations would be determined in the final site design process.

Based on the anticipated mode split percentages including 3 percent walk, 37 percent transit, and 16 percent bus, a large number of pedestrians would access the Springfield site via the surrounding pedestrian network from nearby transit stops and residential areas. The large increase in pedestrians would be due to the increased employment density anticipated at the Springfield site and because the Springfield site is within a 0.5-mile walking distance of several transit options. Also, reduced parking was designed following NCPD guidance to encourage employees to access the site via transit. It is expected that most transit riders would follow sidewalks from the Franconia-Springfield Metro Station to the pedestrian gate at the eastern edge of the Springfield site. These sidewalks either currently exist, would be built with future roadways planned in the No-build Condition, or would be built locally around the Springfield East ECF as part of the Build Condition to connect to the pedestrian network.

Therefore, due to the large increase in pedestrians expected to access the site on foot via the pedestrian network, the Build Condition as planned would have direct, long-term, beneficial impacts to the pedestrian network. The pedestrian impacts would overall be beneficial, rather than adverse, because the sidewalks would be used more often, with overall increased use of the otherwise underused complete streets infrastructure. The sidewalk improvements at the East ECF would reduce barriers to accessing the site, and the increase in pedestrians using transit would improve overall sustainability. Under the Build Condition there would be direct, short-term, adverse impacts to the pedestrian network caused by construction vehicles crossing the sidewalk and pedestrian crosswalks and intermittent sidewalk closures.

5.4 Bicycle Network

As noted for the No-build Condition ([Section 4.3](#)), the Fairfax County Bicycle Master Plan (Fairfax County 2014a) recommends new bicycle lanes on several roadways within the study area. The only bicycle improvements that are known to be funded and therefore would be complete by 2022 as part of the No-build Condition would be the bicycle lanes on Fairfax Drive Extension, covered bicycle storage at the Franconia-Springfield Metro Station and VRE Station, and pedestrian and bicycle improvements between NVCC and the Metrorail (FCDOT 2014). No offsite bicycle improvements are planned as part of the Springfield Build Condition. No offsite bicycle improvements are planned as part of the Springfield Build Condition.

With the planned Frontier Drive Extension (currently Springfield Center Drive) bicycle lanes directly adjacent to the proposed facility, the overall bicycle mode split to the site is projected to be 2.0 percent, resulting in approximately 226 bicycle roundtrips daily. It is assumed that there would be bicycle facilities on site to encourage the use of the bicycle mode of travel.

The increase in bicycle trips from the Springfield Build Condition would increase overall bicycle volumes in the study area. Given the existing amount of bicycle facilities within the study area and those facilities that are proposed, these additional trips would likely be able to be accommodated without any impacts to pedestrian or vehicle traffic. Therefore, the Springfield Build Condition would have no measurable direct, long-term impacts to

the bicycle network. Also under the Springfield Build Condition, there would be direct, short-term, adverse impacts to the bicycle network on Frontier Drive Extension and Loisdale Road caused by construction vehicles blocking the sidewalks or bike lanes and intermittent closures.

5.5 Public Transit

The following sections describe the Springfield Build Condition for the bus and Metrorail modes within the Springfield study area. Similar to the No-build Condition analysis, commuter rail, commuter bus, carsharing, slugging, and private shuttles are not evaluated for the Build Condition because future ridership information or planning documents were not available. It is anticipated that there would be an increase in people commuting to the site via commuter rail, commuter bus, shuttle, or slugging given the overall increase in total trips in the Build Condition. The projected use of shuttles for future FBI employees, however, is discussed below.

5.5.1 Projected Trips

The projected person trips are explained in the Trip Generation and Modal Split section (see [Section 5.2](#)).

5.5.2 Metrorail Analysis

The Metrorail analysis was conducted using projected 2022 No-Build Condition ridership and the additional passenger trips associated with the Springfield Build Condition. The Springfield Build Condition passenger trips were assigned to Metrorail peak hours using the Metrorail/Commuter Rail mode split of 37 percent, and a further reduction of AM peak trips out of the site and PM peak trips into the site, to account for passengers that could use VRE instead of Metrorail. VRE service only operates to Franconia-Springfield Metro Station in the northbound direction during the AM peak and in the southbound direction during the PM peak. The VRE passenger trip reduction was calculated using the current proportion of daily passengers that use VRE instead of Metrorail to and from Franconia-Springfield Metro Station, as shown in [table 5-5](#).

Table 5-5: Franconia-Springfield VRE/Metro Station Ridership Proportions

Franconia-Springfield Station	Northbound Entries		Southbound Exits	
	Total	Percent of Total	Total	Percent of Total
VRE	769	9%	1,012	11%
Metrorail	7,566	91%	7,801	89%
Total	8,335	100%	8,813	100%

Sources: WMATA (2014d); WMATA (2014b); VRE (2014)

With a Metrorail mode split of 37 percent and the VRE reduction (minus nine percent in the AM peak hour and minus 11 percent in the PM peak hour), a total of 1,226 additional AM peak hour passenger trips and 1,134 additional PM peak hour passenger trips are projected. [Table 5-6](#) summarizes the additional Metrorail trips associated with the Springfield Build Condition.

Table 5-6: Franconia-Springfield Build Condition Additional Peak Hour Metrorail Passenger Trips

Employees	Time Period	IN	OUT	Proportion of Daily Total	Rail Mode Split	Metro Percent ^a	Metro Percent ^a	IN	OUT	TOTAL
11,055	AM Peak Hour	93%	7%	29%	37.4%	-	91%	1,116	76	1,192
	PM Peak Hour	5%	95%	26.9%	37.4%	89%	-	49	1,057	1,106
Briefing Center	Time Period	IN	OUT	Proportion of Daily Total	Rail Mode Split	Metro Percent ^a	Metro Percent ^a	IN	OUT	TOTAL
250	AM Peak Hour	100%	-	36%	37.4%	-	91%	34	-	34
	PM Peak Hour	-	100%	29%	37.4%	89%	-	-	27	27
Total People	Time Period							Exits	Entries	TOTAL
11,305	AM Peak Hour							1,149	76	1,226
	PM Peak Hour							49	1,084	1,134

^a These figures represent the percentage of passengers who would use Metrorail instead of VRE, and constitute the “VRE Reduction” previously referenced (VRE 2014).

Source: Springfield Site Transportation Agreement ([Appendix E1](#))

The additional peak hour Metrorail passenger trips were further disaggregated into AM and PM peak 15-minute periods using existing Peak Hour Factors (PHF) at Franconia-Springfield Metro Station. Overall, this would result in an additional 310 passenger trips during the AM peak 15-minute period and an additional 329 passenger trips during the PM peak 15-minute period, as summarized in [table 5-7](#).

Table 5-7: Franconia-Springfield Build Condition Additional Peak 15-Minute Metrorail Passenger Trips

Employees	Time Period	IN	OUT	TOTAL	Peak Hour Factor	Time Period	IN	OUT	TOTAL
11,055	AM Peak Hour	1,116	76	1,192	25%	AM Peak 15-Minute	282	19	301
	PM Peak Hour	49	1,057	1,106	29%	PM Peak 15-Minute	14	307	321
Briefing Center	Time Period	IN	OUT	TOTAL	Peak Hour Factor	Time Period	IN	OUT	TOTAL
250	AM Peak Hour	34	-	34	25%	AM Peak 15-Minute	9	-	9
	PM Peak Hour	-	27	27	29%	PM Peak 15-Minute	-	8	8
Total People	Time Period			Peak Hour Factor	Time Period	Exits	Entries	TOTAL	
11,305	AM Peak Hour	1,149	76	1,226	25%	AM Peak 15-Minute	290	19	310
	PM Peak Hour	49	1,084	1,134	29%	PM Peak 15-Minute	14	315	329

Source: Springfield Site Transportation Agreement (Appendix E1); WMATA (2014d); WMATA (2014b)

Overall, the Springfield Build Condition would result in an additional 4,223 weekday entries at the Franconia-Springfield Metro Station, bringing the weekday station entry total to 13,301 passengers (see table 5-8). Average weekday exits would theoretically be the same or similar to the average weekday entries.

Table 5-8: Weekday 2022 Projected Metrorail Ridership at Franconia-Springfield Metro Station

Station	Average Weekday Entries					
	2014	2022 Background Growth	2022 Planned Development Projects	2022 Total No-build	2022 Additional Springfield Build Trips	2022 Total Springfield Build Trips
Franconia-Springfield	7,566	8,915	163	9,078	4,223	13,301

Source: WMATA (2014b); WMATA (2014d); MWCOG (2015); Springfield Site Transportation Agreement (Appendix E1)

5.5.2.1 Metrorail Passenger Loads

Metrorail passenger loads at Franconia-Springfield Metro Station were calculated based on projected 2022 No-build Condition ridership (background growth plus planned development passenger trips) plus the additional Springfield Build Condition passenger trips disaggregated to peak 15-minute periods. Because Franconia-Springfield is a terminal station, passenger loads are equal to the total number of exiting passengers per train in the outbound direction (trains ending at the station) or the total number of entering passengers per train in the inbound direction (trains beginning at the station). Outbound exiting passengers during the PM peak period were higher than inbound entering passengers during the AM peak period at the station; therefore, PM peak 15-minute exits were used for this analysis.

No expansion of WMATA’s current Metrorail fleet was assumed for this analysis to provide the most conservative estimate of potential capacity issues. The Momentum Plan does call for all eight-car trains on all lines during peak

periods by the year 2020; however, this would require significant upgrades to electrical systems and a significant expansion of WMATA’s current fleet of railcars (WMATA 2014e). All trains were assumed to have six cars with the exception of Blue line trains, which typically have eight during peak periods (WMATA 2014f).

WMATA has three thresholds for railcar occupancy: less than 100 passengers per car (acceptable), between 100 and 120 passengers per car (crowded), and greater than 120 passenger per car (extremely crowded). Capacity is generally considered to be 120 passengers per car. Projected passenger loads under the Springfield Build Condition at the station are well below 100 passengers per car, and therefore would be considered acceptable. **Table 5-9** summarizes passenger loads per car under the Springfield Build Condition using PM peak 15-minute exits.

Table 5-9: Franconia-Springfield Build Condition Peak Metrorail Passenger Loads

Measure (PM Peak 15-Minute Exits)	Unit
2014 Maximum Passengers	486
2022 Passengers with Background Growth	572
2022 Passengers Development Projects	8
2022 Total No-build Passengers	581
2022 Minimum Trains ^a	2
2022 Train Cars ^b	14
2022 Total No-build Passengers Per Car	41
2022 Springfield Build Additional Passengers	14
2022 Total Springfield Build Passengers	595
2022 Total Springfield Build Passengers Per Car	43

^a A 6-minute headway equates to 2.5 trains every 15 minutes. This figure was rounded down to two in order to provide the most conservative load estimate.

^b Assumes two 6-car Silver line trains and one 8-car Blue line train.

Source: WMATA (2014b); WMATA (2014d); MWCOG (2015); Springfield Site Transportation Agreement ([Appendix E1](#))

5.5.2.2 Station Capacity Analysis

A capacity analysis was conducted for the vertical elements (escalators and stairs), faregate aisles, fare vending machines, and platforms at the Franconia-Springfield Metro Station. The analysis used 2022 Springfield Build Condition peak 15-minute periods of ridership (entries and exits) at the station (see [table 5-7](#)).

Volume-to-capacity (v/c) ratios were calculated for the vertical elements and fare elements, and pedestrian LOS was calculated for the platform area. Analysis for vertical elements and faregate aisles used projected ridership from the peak exiting period at the station – the time period when the highest total number of passengers would use each element. **Table 5-10** summarizes ridership during the peak exiting periods at Franconia-Springfield Metro Station.

Table 5-10: Springfield Build Condition Weekday Peak 15-Minute Exiting Period Ridership

Metro Station	Time	2014		2022 No-Build		2022 Build	
		Entries	Exits	Entries	Exits	Entries	Exits
Franconia-Springfield	5:00 PM – 5:15 PM	82	486	138	581	453	595

Source: WMATA (2014b); WMATA (2014d); MWCOG (2015); Springfield Site Transportation Agreement ([Appendix E1](#))

The platform area analysis and fare vending analysis used projected Springfield Build Condition ridership from the peak entering period at the station – the time period when the highest number of passengers would likely use fare vending machines and be waiting on the platform. [Table 5-11](#) summarizes ridership during the peak entering period at Franconia-Springfield Metro Station.

Table 5-11: Springfield Build Condition Weekday Peak 15-Minute Entering Period Ridership

Metro Station	Time	2014		2022 No-build		2022 Build	
		Entries	Exits	Entries	Exits	Entries	Exits
Franconia-Springfield	7:30 AM – 7:45 AM	445	41	530	89	549	380

Source: WMATA (2014b); WMATA (2014d); MWCOG (2015); Springfield Site Transportation Agreement ([Appendix E1](#))

Overall, vertical elements, faregate aisles, and fare vending machines at the station are projected to operate within capacity, or below a v/c of 0.7. Additionally, platform peak pedestrian LOS (based on the available spacing between passengers) on the busiest platform sections are projected to be at the acceptable LOS B.

[Table 5-12](#) summarizes the results of the Franconia-Springfield Metro Station capacity analysis under the Springfield Build Condition, including the vertical elements, fare elements, and platforms. Further details on the station capacity analysis are found in [Appendix E3](#).

Table 5-12: 2022 Franconia-Springfield Metro Station Build Condition Station Capacity Analysis Summary

Element		Volume to Capacity (V/C) Ratio
Mezzanine/ Platform	Entry Escalators	0.21
	Exit Escalators	0.25
	Stairs	0.44
Faregate Aisles		0.26
Fare Vending		0.21
Platform Peak LOS		B

Sources: WMATA (2014b); WMATA (2014d); Franconia-Springfield Metro Station Site Inventory (December 2014); Springfield Site Transportation Agreement ([Appendix E1](#))

5.5.2.3 NFPA 130 Emergency Evacuation Analysis

An emergency evacuation analysis was conducted to compare evacuation capacity of Franconia-Springfield Metro Station to standards set by NFPA 130 code (TRB 2013). NFPA 130 requires that station platforms be fully evacuated with 4 minutes and that all passengers reach a point of safety within 6 minutes. WMATA Metrorail stations, however, are not required to meet these criteria. Details on the assumptions and calculations

necessitated in NFPA 130 are found in [Appendix E4](#). A summary of the emergency evacuation analyses is included below, with further details on the station analysis included in [Appendix E4](#).

The NFPA 130 analysis used the number of entries and exits from the peak 15-minute period under the Springfield Build Condition (5:00 PM to 5:15 PM) at the station. [Table 5-10](#) summarizes the volume of passengers entering and exiting the station during this period.

Using the Springfield Build Condition peak 15-minute ridership period and NFPA 130 assumptions and guidelines, the platform at the Franconia-Springfield Metro Station could be evacuated in 4.0 minutes, and the entire station could be evacuated to a point of safety within 9.8 minutes.

5.5.3 Bus Analysis

The additional bus trips associated with the Springfield Build Condition are summarized in [table 5-13](#). At a local bus mode split of 6.0 percent, approximately 198 additional AM peak hour bus passenger trips and 183 additional PM peak hour bus passenger trips are projected in the study area.

Table 5-13: Springfield Build Condition Additional Peak Hour Local Bus Passenger Trips

Employees	Time Period	Proportion of Daily Total	Local Bus Mode Split	TOTAL LOCAL BUS TRIPS
11,055	AM Peak Hour	29%	6.0%	192
	PM Peak Hour	26.9%	6.0%	178
Briefing Center	Time Period	Proportion of Daily Total	Local Bus Mode Split	TOTAL LOCAL BUS TRIPS
250	AM Peak Hour	36%	6.0%	5
	PM Peak Hour	29%	6.0%	4
Total People	Time Period			TOTAL LOCAL BUS TRIPS
11,305	AM Peak Hour			198
	PM Peak Hour			183

Source: Springfield Site Transportation Agreement ([Appendix E1](#))

The additional peak hour bus passenger trips associated with the Springfield Build Condition were added to the peak hour bus volumes calculated for the study area in the 2022 No-Build Condition. The trips were added proportionally to each route within the study area based on No-Build Condition ridership. For this analysis, it was assumed that there would be no major changes in bus service in the study area by 2022.

Overall, AM peak hour Springfield Build Condition bus volumes are projected to total 1,106 passengers, and PM peak hour volumes are projected to total 1,087 passengers. These totals are both below the overall capacity of services, as summarized in [table 5-14](#), meaning the additional passenger trips projected could be adequately handled by current service levels. No individual routes are projected to experience capacity issues either. [Appendix E6](#) has further details on the bus capacity analysis.

Table 5-14: Springfield Build Condition Bus Capacity Analysis

Measure	2014		2022 No-build Condition		2022 Build Condition	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Total Volume	760	758	908	904	1,106	1,087
Total Capacity	2,459	2,441	2,459	2,441	2,459	2,441
Volume to Capacity Ratio (V/C)	0.31	0.31	0.37	0.37	0.45	0.45

Source: Springfield Site Transportation Agreement ([Appendix E1](#)); Springfield Site Trip Generation Summary (see *Traffic Analysis* section) (2015); WMATA (2014a); WMATA (2014d); MWCOG (2015).

5.5.4 Level of Impact

The increase in public transit trips from the Springfield Build Condition would have the following impacts to transit:

- The overall capacity of bus services in the study area would accommodate the projected ridership, and no individual routes would experience capacity issues.
- Metrorail car passenger loads through the study area are projected to be at acceptable levels.
- Overall, Metrorail vertical elements, faregate aisles, and fare vending machines at the Franconia-Springfield Metro Station are projected to operate below capacity.
- Metrorail platform peak pedestrian LOS (based on the available spacing between passengers) on the busiest platform sections are projected to be at the acceptable LOS B at the Franconia-Springfield Metro Station.
- Platform and station evacuation times would increase slightly over the No-build Condition. Platform evacuation times would continue to meet NFPA 130 standards, and station evacuation times would continue to exceed NFPA 130 standards.

Therefore, the Springfield Build Condition would have no measurable direct, long-term impacts to public transit. In addition, bus operations along one bus route would have direct, long-term, adverse impacts caused by the potential traffic delays forecasted along Loisdale Road (see [Section 5.7 Traffic Analysis](#)). The same bus line that regularly services Springfield Center Drive and Loisdale Road would encounter direct, short-term, adverse impacts caused by construction vehicles blocking some or all of the lanes and intermittent road closures.

5.6 Parking

Under the Build Condition, employee parking garages would be located to the north and east of the Main Building developable area along the northeastern site boundary, adjacent to Metropolitan Center Drive ([figure 5-3](#)). Given the distance to the nearest transit station, and in accordance with NCPC parking policy, a parking ratio of one parking space for every three employees would be maintained, equating to approximately 3,600 spots. In the conceptual site layout analyzed in the EIS, these spaces would be accommodated in two, eight-story parking structures. The final number and layout of the parking structures to accommodate the required employee and fleet vehicle parking would be determined during the design process. Up to 145 visitor parking spaces would be provided near the VC.

While all employee and visitor parking is envisioned to be accommodated onsite, it is likely that there would be more employee demand for driving than there are parking spaces due to the less than 1:1 ratio of parking spaces to employees (not all employees would have a parking spot) as recommended by NCPC policies. As an “end-of-

the-line” station, Metrorail may not seem like the best travel option from other sides of the city. Therefore, some employees may try to park on local streets (Frontier Drive Extension would have on-street, short-term, metered parking) or park on local residential streets that do not have parking restrictions. Still others may choose to pay to park in local area parking garages. Development and implementation of a Transportation Management Plan (TMP), which includes Transportation Demand Management (TDM) measures that will encourage employees to use transit and discourage employees from driving and parking offsite, will address these issues and reduce any adverse parking impacts anticipated at the Springfield site. With implementation, monitoring, and enforcement of a TMP, and revisions as needed, the Build Condition would result in no measurable direct, long-term impacts to local area competition for parking. Assuming all construction equipment and employee parking areas would be contained to the Springfield site, there would be no measurable direct, short-term impacts to parking in the study area during the construction period.

Figure 5-3: Greenbelt Site Parking



Site Boundary	Private Parking Garage		0 500 1,000 1,500 Feet 1 inch = 1,200 feet
Private Surface Parking	Public Parking Garage		
Public Surface Parking			
Restricted/Permitted On-Street Parking			
Unrestricted On-Street Parking			

Sources:
 ESRI (2013), GSA (2013)
 Fairfax County (2014), Google Maps (2015), Louis Berger (2015)

5.7 Truck Access

Truck access for the Springfield site would occur at the northwestern corner of the site off of Loisdale Road. Trucks would only be permitted to enter and exit during non-peak hours; therefore, peak traffic hours on adjacent

roadways would not be impacted. Truck entrance and exit locations and restricted hours would be noted at entrance locations and communicated to those services that would provide regular truck delivery to the site. It should be noted that the location of the truck access off of Loisdale Road was designed to prevent trucks from using local neighborhood roads to access the site.

Under the Build Condition, there would be no measurable direct, long-term impacts to truck access given communication of truck access regulations. Assuming the Springfield site would have access entrances and exits assigned for construction equipment and general trucks during the construction period, there would be no measurable direct, short-term impacts to truck access.

5.8 Traffic Analysis

The future projected traffic analysis is based on the proposed alternative to consolidate the FBI HQ at the Springfield site. The next sections describe the process the study followed to project future traffic volumes through three primary assumptions: trip generation, modal split, and trip distribution, followed by a discussion of the impacts of the proposed alternative.

5.8.1 Total Vehicle Trips

The projected person trips are explained in the Trip Generation and Modal Split section (see [Section 5.2](#)). Once the modal split is applied, the vehicle trip generation can be calculated. Based on the trip generation rates combined with the SOV and HOV modal split and persons per carpool, the total vehicle trips are forecasted to be 1,024 inbound and 75 outbound during the AM peak hour and 49 inbound and 966 outbound during the PM peak hour.

[Tables 5-15 and 5-16](#) summarize the vehicle trips based on the trip generation and the mode split.

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Table 5-15: AM Peak Hour Vehicle Trips

Calculated Steps	AM Peak Hour (7:30 AM – 8:30 AM)									
	FBI Employees				Briefing Center ^a				Total People	
	Inbound		Outbound		Inbound		Outbound		TOTAL	
	SOV	HOV	SOV	HOV	SOV	HOV	SOV	HOV	Inbound	Outbound
Employees or Seats	11,055				250					
Trip Generation	29%				36%					
Inbound/Outbound Split	93%		7%		100%		0%			
Modal Split	30.6%	11.0%	30.6%	11.0%	30.6%	11.0%	30.6%	11.0%		
Total Trips w/o HOV adjustment	912	328	69	25	28	10	0	0		
HOV Vehicle Occupancy		4		4		4		4		
Total Trips	912	82	69	6	28	2	0	0	1,024	75

^a Assumes a 500-seat facility where external trips represent 50% of attendees.

Table 5-16: PM Peak Hour Vehicle Trips

Calculated Steps	PM Peak Hour (5:00 PM – 6:00 PM)									
	FBI Employees				Briefing Center ^a				Total People	
	Inbound		Outbound		Inbound		Outbound		TOTAL	
	SOV	HOV	SOV	HOV	SOV	HOV	SOV	HOV	Inbound	Outbound
Employees or Seats	11,055				250					
Trip Generation	26.9%				29%					
Inbound/Outbound Split	5%		95%		0%		100%			
Modal Split	30.6%	11.0%	30.6%	11.0%	30.6%	11.0%	30.6%	11.0%		
Total Trips w/o HOV adjustment	45	16	864	311	0	0	22	8		
HOV Vehicle Occupancy		4		4		4		4		
Total Trips	45	4	864	78	0	0	22	2	49	966

^a Assumes a 500-seat facility where external trips represent 50% of attendees.

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5.8.2 Trip Distribution

Based on the Springfield Site Transportation Agreement, it is assumed that 50 percent of existing FBI employees would relocate to the new site, and the other 50 percent would represent new FBI employees who would choose to locate in proximity of the proposed Springfield site.

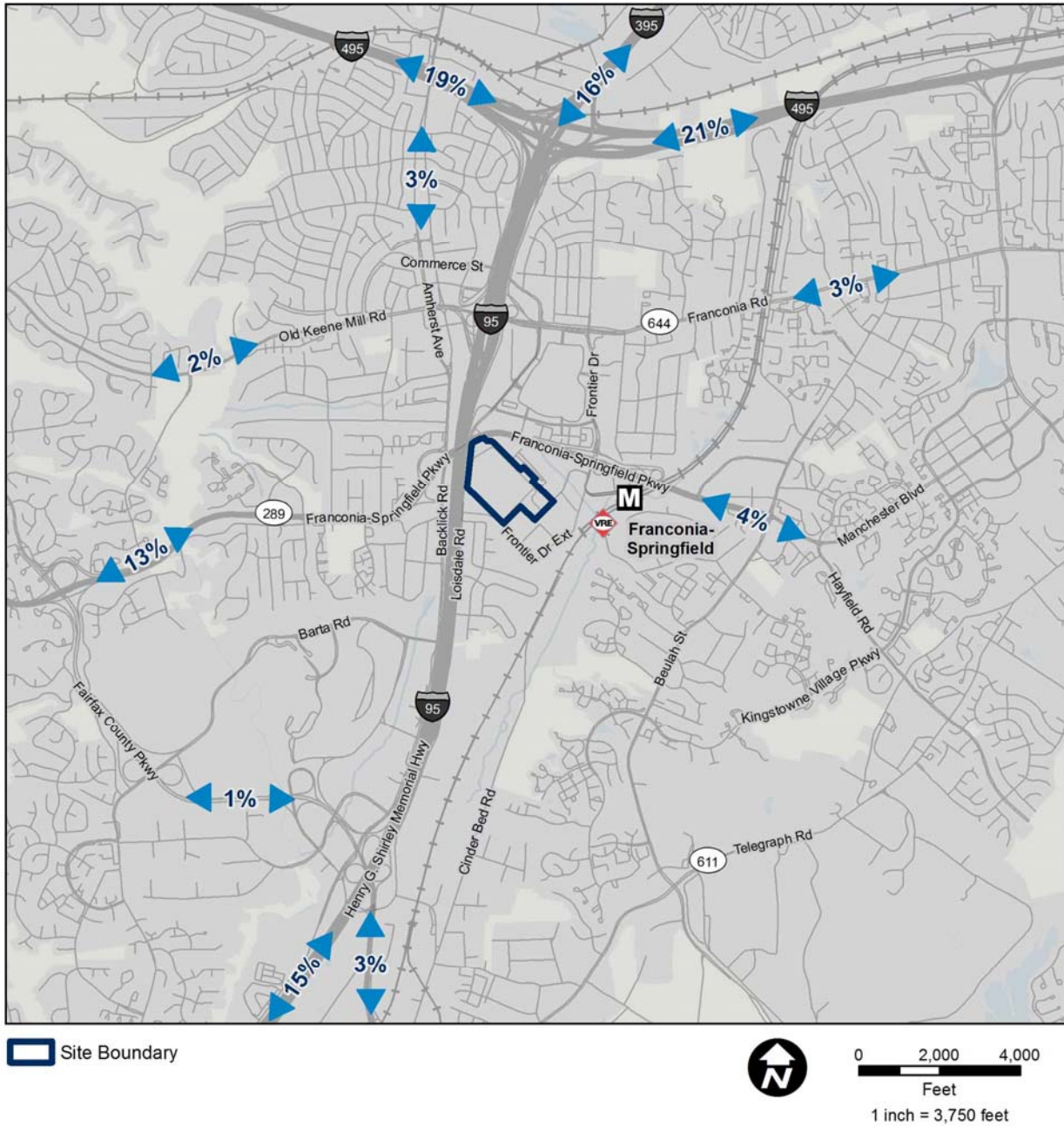
The trip distribution for work trips is composed of two sources, the existing FBI home zip codes and MWCOG travel demand model. The FBI estimates that approximately 50 percent of the existing FBI staff would retire, transfer to another FBI site outside the National Capital Region, or resign once the new HQ is operational; therefore, 50 percent of the distribution is based on the FBI zip code database. The existing FBI home zip codes are used as the home origin and home destination. The other 50 percent of trips are based on distribution patterns in the Springfield area from the 2020 MWCOG travel demand model for home-based work trips because the model trip tables represent a more local distribution reflecting new employee interest in residing close to the consolidated FBI HQ (MWCOG 2014). The two distribution patterns (home zip code plus MWCOG trip tables) were averaged to form a blended trip distribution. Because the Mission Briefing Center external vehicle trips would most likely not resemble a localized trip pattern, the study used the same blended trip distribution for these vehicle trips.

Table 5-17 shows the Springfield Site Transportation Agreement approved blended trip distribution percentages to/from each origin/destination. Figure 5-4 contains the Springfield site Build Condition trip distribution.

Table 5-17: Springfield Site Build Condition Trip Distribution Summary

Roadway and Direction	Percentages		AM Trips		PM Trips	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
I-95/I-495 EB	21.0%	21.0%	215	16	10	203
I-95 SB	15.0%	15.0%	154	11	7	145
I-495 NB	19.0%	19.0%	195	14	9	184
I-395 NB	16.0%	16.0%	164	12	8	155
Backlick Road NB	3.0%	3.0%	31	2	1	29
Old Keene Mill Road WB	2.0%	2.0%	20	2	1	19
Franconia Road EB	3.0%	3.0%	31	2	1	29
Franconia Springfield Parkway WB	13.0%	13.0%	133	10	6	126
Franconia Springfield Parkway EB	4.0%	4.0%	41	3	2	39
Fairfax County Parkway WB	1.0%	1.0%	10	1	0	10
Fairfax County Parkway EB	3.0%	3.0%	31	2	1	29
Total	100.0%	100.0%	1,024	75	49	966

Figure 5-4: Springfield Site Build Condition Trip Distribution



Sources:
 ESRI (2013), GSA (2013)
 Fairfax County (2014)

5.8.3 Entry Control Facility

The ECF is a security check point for all vehicles to pass through to access the internal roadway serving the parking garages, loading docks, and other components of the Springfield site. Each vehicle would be expected to stop at the facility while FBI security personnel screen the vehicle and occupants before being allowed to proceed. Similar to a tollgate along a highway, the ECF might cause a queue; therefore, the analysis must determine if a queue might spill beyond the planned driveway onto the street network.

The ECF has four elements: separate lanes for FBI security personnel to process each vehicle as it arrives at the Springfield site; barriers separating each lane; a stop line where each vehicle would be processed; and a merging area after the processing area. Each component was coded in the TransModeler™ Traffic Simulation Software (TransModeler™) to best represent the conditions each vehicle would experience as it enters the Springfield site. Based on the preliminary conceptual site plan, TransModeler™ allows the ECF components to be situated at their proper location based on the set-back distances already determined through the site plan planning process. Because the preliminary conceptual site plan called for two lanes serving the ECF from the Frontier Drive Extension, four lanes were initially coded to ensure enough capacity. The preliminary conceptual site plan called for one lane serving the ECF from Metropolitan Center Drive; however, to avoid any potential delays two-lanes were initially coded.

The ECF processing times are a critical component of the analysis because these times determine the number of lanes required at each ECF facility to avoid the queue spilling onto the external roadways (Frontier Drive Extension and Metropolitan Center Drive in this case). It was determined that existing processing times at the JEH building would provide the best indication of future processing time at the three alternative sites. A special ECF processing study was undertaken on December 4, 2014, between 6:20 AM and 7:50 AM during the AM peak period. Processing times and vehicle occupancy were recorded for each vehicle (78 vehicles) entering the JEH parking garage located under the building. A parking garage guard shift change occurred during the survey midpoint allowing approximately half the sampling during the first guard and half during the second guard, thereby providing a good cross section of processing times. Processing times ranged from 7 seconds for SOV up to 103 seconds for vanpools.

Based on the processing times obtained through the survey, a probability triangle was created to develop a range of vehicle processing times to code into TransModeler™. These probabilities range from 10 percent to 90 percent, fitting a triangular distribution (a continuous probability distribution shaped like a triangle defined by three values: the minimum or 10th percentile value, the maximum or 90th percentile value, and the peak or 50th percentile value). Based on the survey, there was an average of 14.1 seconds per vehicle, which includes carpools and vanpools entering. Since the carpool and vanpools represent a small number of vehicle entering and have much higher processing times than SOVs, the average without those vehicles was calculated, resulting in 12.3 seconds per SOV vehicle. The 14.1 second value was assigned the 90th percentile and the 12.3 seconds was assigned the 50th percentile. To be conservative, the 10th percentile was calculated based on the percent difference between 50th percentile value (12.3 seconds) and 90th percentile value (14.1 seconds). The difference of 1.73 percent subtracted from 12.3 seconds resulted in a 10th percentile value of 10.6 seconds per vehicle. Since TransModeler™ requires a percentage assigned to each processing time, the 15th percentile and 85th percentile were interpolated to fill in the remaining available 30 percent in the processing times. **Table 5-21** contains the processing probabilities.

Table 5-18: Processing Probabilities

	10th Percentile	15th Percentile	50th Percentile	85th Percentile	90th Percentile
Percentage used in TransModeler™	10	15	50	15	10
Vehicles per Second	10.6	10.8	12.3	13.9	14.1

Once the ECFs were coded, simulations were run to observe how TransModeler™ assigned each vehicle to the available lanes. Calibrations were entered to balance the use of available lanes, thus providing the highest capacity given the available queuing space. The ECF analysis was conducted after all the external roadway

mitigation measures (recommended improvements to address failing traffic operations) were determined. This allowed for TransModeler™ to be coded with the recommended lane geometry (number of left-turn, through, and right-turn lanes) and traffic signal timings before testing the ECF queuing, thus the maximum number of inbound FBI vehicles would be entering the Springfield site.

The ECF simulation analysis followed a statistical approach. This was performed by running the simulation 25 times to calculate the standard deviation based on the vehicles hour of travel (VHT) metric. VHT provides a good indication of vehicle delays by requiring more simulations given facility operation and queuing issues. Using the calculated standard deviation, the number of simulations required was calculated to be within plus or minus 2 percent at the 95th percentile confidence interval (when all the required simulation runs are averaged, 95 percent of the results will be accurate to within plus or minus 2 percent).

Once the simulations were completed, three different measures were extracted from TransModeler™ to report the estimated queuing based on the total number of available lanes. These measures included vehicles processed per hour, average queue length (similar to the 50th percentile queue length), and maximum queue length (similar to a 100 percentile queue length). Together, these values provide an indication whether or not the available queue space would provide enough storage or the queue would impact the Frontier Drive Extension or Metropolitan Center Drive.

Based on the ECF processing time probabilities entered into TransModeler™, the software reported an upper limit of approximately 200 vehicles per hour per entry lane being processed. By comparison, the *Better Military Traffic Engineering Pamphlet 55-17* (SDDCTEA 2011) reports the lowest range of vehicle throughput for manually controlled operations is 300 vehicles per hour per lane. This value represents conditions at a military base under the BRAVO Force Protection alert status or a condition where each vehicle would be required to be inspected as well as each occupant. The ECF processing time therefore represents a reasonable and conservative estimate.

5.8.4 Development of Build Condition

It is important to note that the Build Condition includes GSA trips removed from the existing GSA site as well as the addition of the forecasted FBI vehicle trips and No-build vehicle trips. The existing vehicle trips generated by the existing GSA site were removed first from the study area network before adding the forecasted FBI vehicle trips. The existing condition volumes obtained for the two intersections serving the GSA site were added together to develop the inbound and outbound flows during both peak hours. The distribution relied on the same source as the planned developments, the Springfield Mall Town Center Traffic Impact Study office distribution pattern (GS 2008) (see [Appendix E7](#)). Based on the existing condition traffic counts, a total of 222 vehicle trips were removed from the AM peak hour network, and 94 vehicle trips were removed from the PM peak hour network. Broken down into the entry and exit volumes, 173 vehicles entered and 49 exited during the AM peak hour and 11 vehicles entered and 83 existed during the PM peak hour. [Table 5-22](#) contains the GSA trips removed.

Table 5-22: GSA Site Trips Removed

AM PEAK HOUR			PM PEAK HOUR		
IN	OUT	TOTAL	IN	OUT	TOTAL
173	49	222	11	83	94

Because there are multiple routes that could be accessed between the Interstate system (I-95, I-395, and I-495) and the Springfield site, TransModeler™ also performed the selection of which route to assign vehicle trips. Performing the vehicle assignments required validating and calibrating the TransModeler™ developed roadway network. [Appendix E8](#) contains the TransModeler™ validation and calibration process.

Once calibrated and validated based on the existing conditions, the study area intersections (modeled network) were adjusted to match the optimized traffic signal settings calculated through the No-build Condition. This reflects adjusted signal timings based on the No-build Condition projected vehicle volumes because it is assumed that VDOT would revise the traffic signals to improve the vehicle flow over the next 8 years leading to 2022 based on vehicle volumes changing due to the planned developments.

The Springfield site internal roadway network was added to the modeled network based on the preliminary conceptual site plan, which included roadway connections to the external network. Because of the magnitude of the proposed development in terms of FBI vehicle trips, the intersections serving the Springfield site were designed with traffic signals and optimized to handle an estimate of the future Build Condition traffic volumes. These intersection upgrades are probably mitigation measures and would be further analyzed in the Build with Mitigation Condition to determine their final recommended design. Synchro™ was used to develop the traffic signal timing plans and entry and exit driveway lane geometry based on forecasted FBI vehicle volumes. The following potential mitigation measures were coded to reflect necessary upgrades to the intersections serving the site driveways.

- A. Frontier Drive Extension and Site South Access: Install a traffic signal and create a three-lane approach exiting the Springfield site with two right-turn lanes and one left-turn lane.
- B. Frontier Drive Extension and Metropolitan Center Drive: Install a traffic signal and create a three-lane eastbound approach from Metropolitan Center Drive including two left-turn lanes and one right-turn lane.

The entry driveways leading to ECFs were coded to match or exceed the number of entry lanes designed in the preliminary conceptual site plan to minimize trip assignment (trip redistributions that would occur in the model) based on ECF facility delays. (Note that the revised conceptual site plan shows seven total inbound lanes due to the analysis performed in the mitigation section; however, the preliminary conceptual site plan shows four total inbound lanes). These facilities are considered part of the preliminary conceptual site plan and are not mitigation measures. The following two locations were coded in TransModeler™ to serve as entrances or exits leading to or from the ECFs:

- Frontier Drive Extension and Site South Access: Five-lane entry and two-lanes exit
- Metropolitan Center Drive and Site East Access: Two-lane entry and one-lane exit

Following a few more simulation trails using TransModeler™, it became necessary to improve the manner in which the internal roadways were proposed to operate to avoid major queuing issues inside the fence. Thus, the following adjustments were coded in TransModeler™:

- Upgrade the intersection between the roadway accessing the site south access (north-south orientation) and the roadway connecting the site east access and garages to a traffic signal control to avoid causing a queue along the site south access back through the ECF
- Assign the middle lane along the roadway serving the garages as reversible depending on the time of day (westbound during the AM peak period and eastbound at all other times)

Once the modeled network contained the No-build Condition traffic signal timings, connections between the Springfield site and external roadways, traffic signals directly serving the proposed site driveways, and internal improvements, TransModeler™ was used to assign vehicle trips to the modeled network through a process called Dynamic Traffic Assignment (DTA). The DTA is a process where vehicle trips are assigned through a testing process during a number of simulation runs. The DTA goal is to develop a trip assignment that provides the best travel times for all vehicles. Once the vehicle travel times are minimized, the number of vehicles assigned to each route where multiple routes between the same origin and destination exist are balanced. This mimics the activity that commuters undertake when they seek alternative routes to avoid traffic delays. Commuters naturally improve

traffic conditions where an alternative route has the capacity to handle the increase in vehicle volumes. To allow the software to test a number of options, the software was set for 30 simulation runs. At the conclusion of the simulation runs, the software recorded the version with the best vehicle travel times; these vehicle routes were used to perform the operation and queue analysis using Synchro™. Because there are several alternative routes available, the DTA result provided a split in six inbound vehicle flows between Franconia Road and the Springfield site via Loisdale Road or Frontier Drive. **Table 5-23** contains the DTA vehicle assignment. **Figure 5-5** shows the Build Condition trip generation representing the removal of existing GSA trips and addition of consolidated HQ FBI trips. **Figure 5-6** shows the Build Condition turning movement volumes, and **figure 5-7** shows the build condition lane geometry.

Table 5-23: DTA Vehicle Assignments

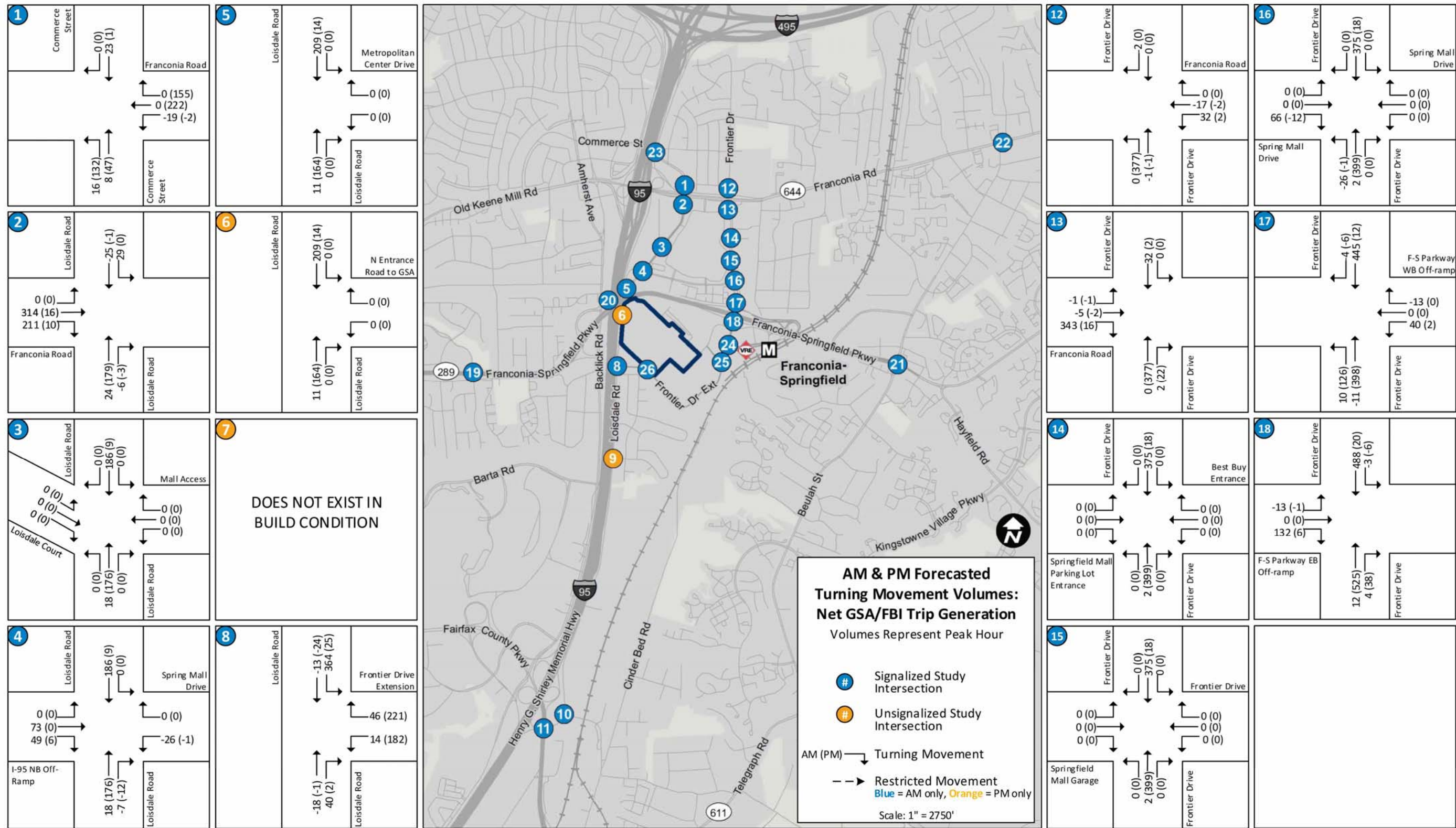
Route Origin	Primary Route to Site	AM Peak Hour		PM Peak Hour	
		Inbound	Outbound	Inbound	Outbound
I-95/495 North	Loisdale Road	47%	100%	43%	42%
	Frontier Drive	53%	0%	57%	58%
I-95 South	Loisdale Road	53%	0%	100%	0%
	Spring Mall Drive/Frontier Drive	47%	0%	0%	0%
	Loisdale Road/FCP	0%	100%	0%	100%
I-495 North	Loisdale Road	47%	100%	43%	28%
	Frontier Drive	53%	0%	57%	72%
I-395 North	Loisdale Road	47%	100%	43%	40%
	Frontier Drive	53%	0%	57%	60%
Backlick Road	Loisdale Road	9%	100%	100%	23%
	Frontier Drive	91%	0%	0%	77%
Old Keene Mill Road	Loisdale Road	60%	100%	100%	45%
	Frontier Drive	40%	0%	0%	55%
Franconia Road	Loisdale Road	0%	0%	0%	21%
	Frontier Drive	100%	100%	100%	79%
FSP West	Frontier Drive	100%	100%	100%	100%
FSP East	Frontier Drive	100%	100%	100%	100%
FCP North	Loisdale Road	100%	100%	100%	100%
FCP South	Loisdale Road	100%	100%	100%	100%

Notes:

FSP = Franconia Springfield Parkway

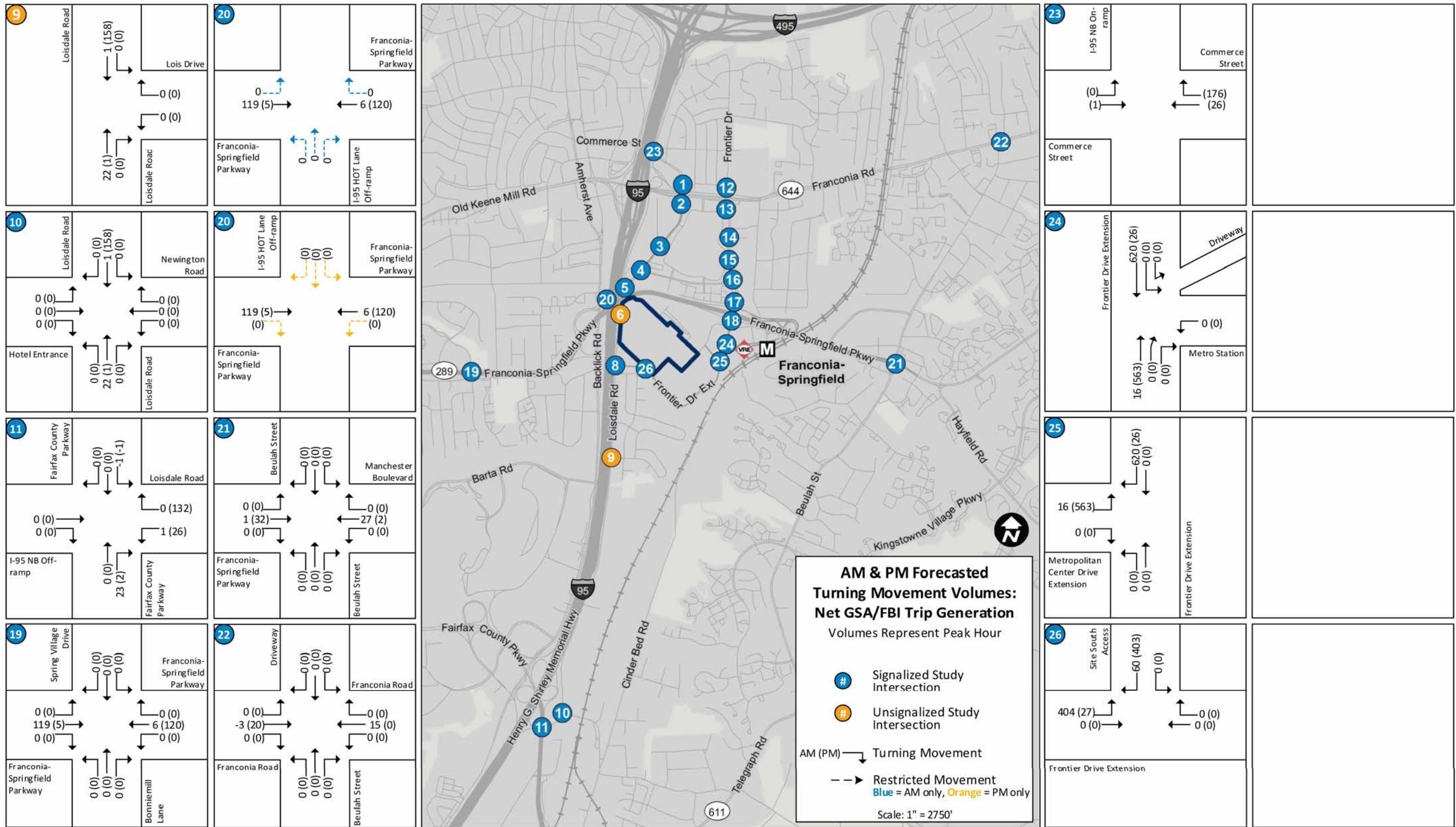
FCP = Fairfax County Parkway

Figure 5-5: Build Condition Trip Generation



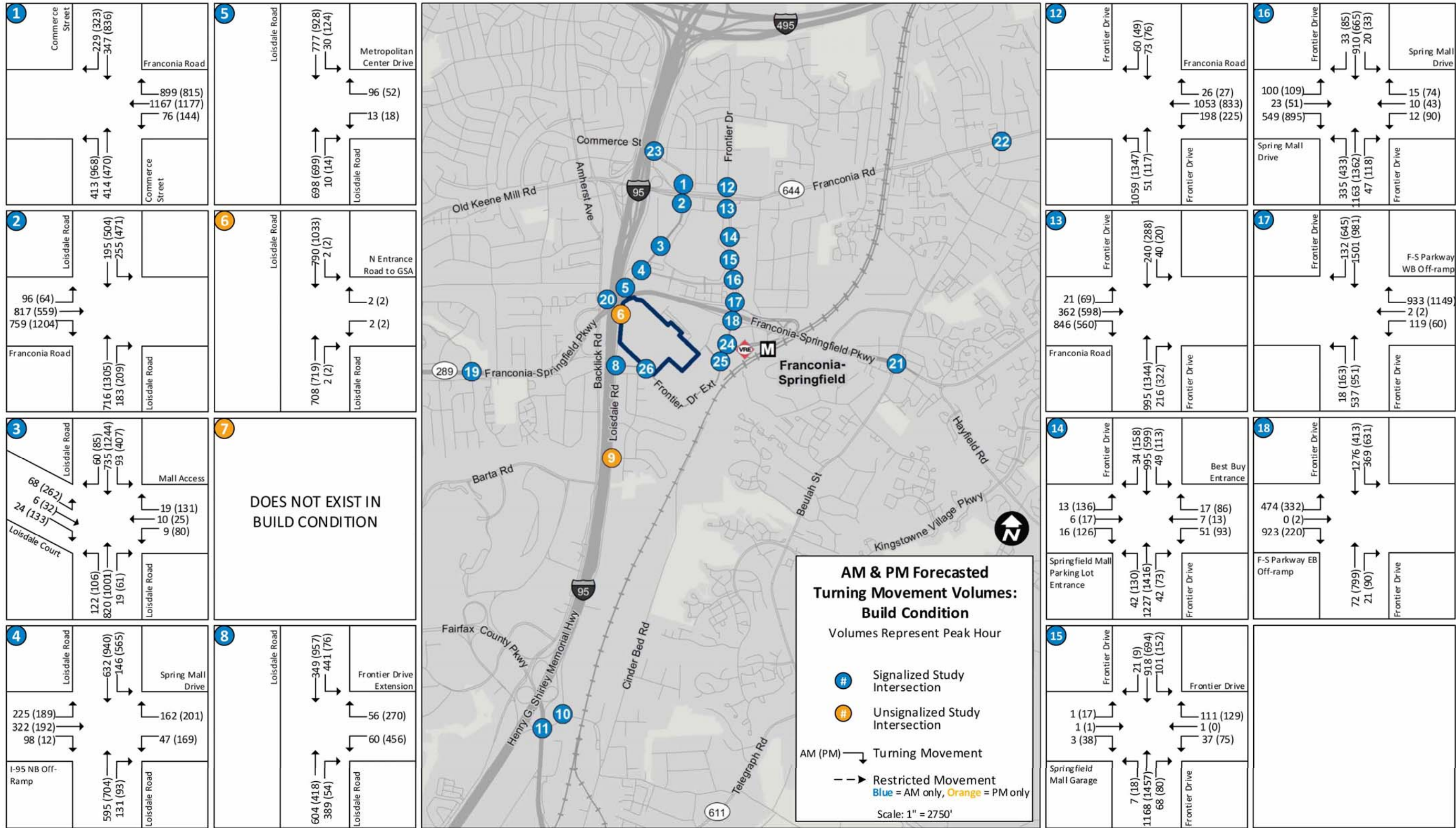
Note: Intersection #23 is analyzed only during the PM peak hour.

Figure 5-5: Build Condition Trip Generation (continued)



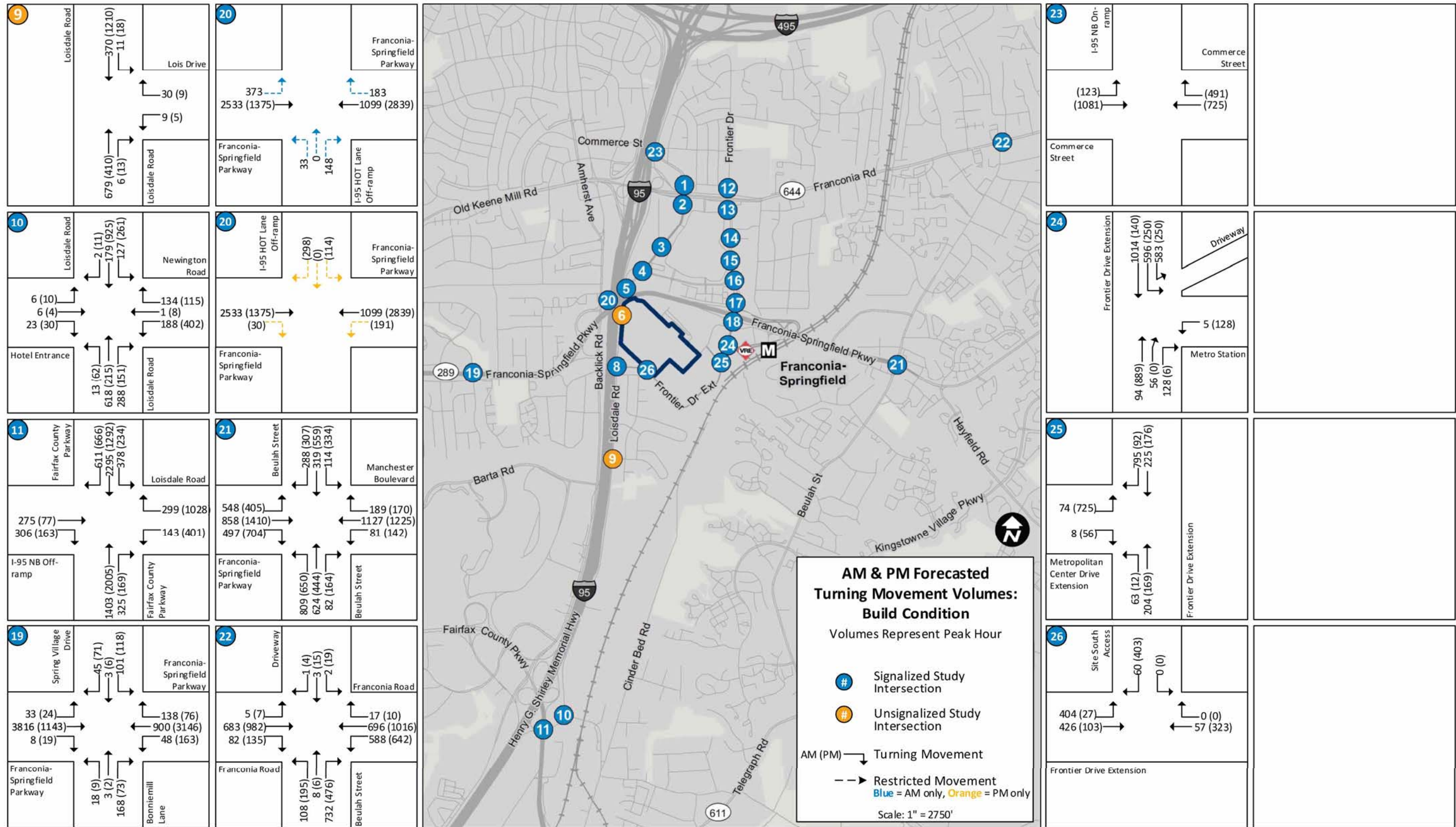
Note: Intersection #23 is analyzed only during the PM peak hour.

Figure 5-6: Build Condition Turning Movement Volumes



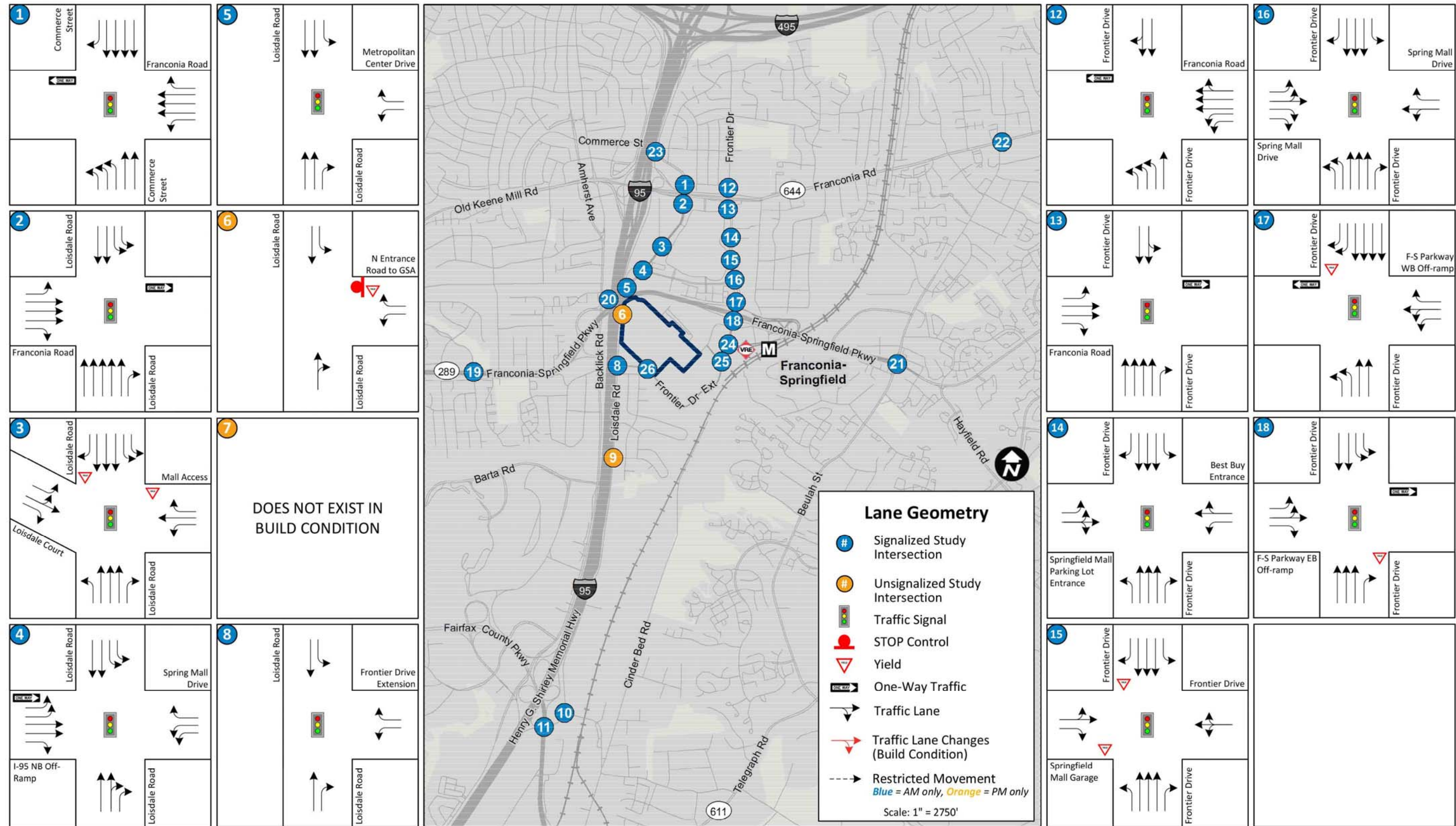
Note: Intersection #23 is analyzed only during the PM peak hour.

Figure 5-6: Build Condition Turning Movement Volumes (continued)



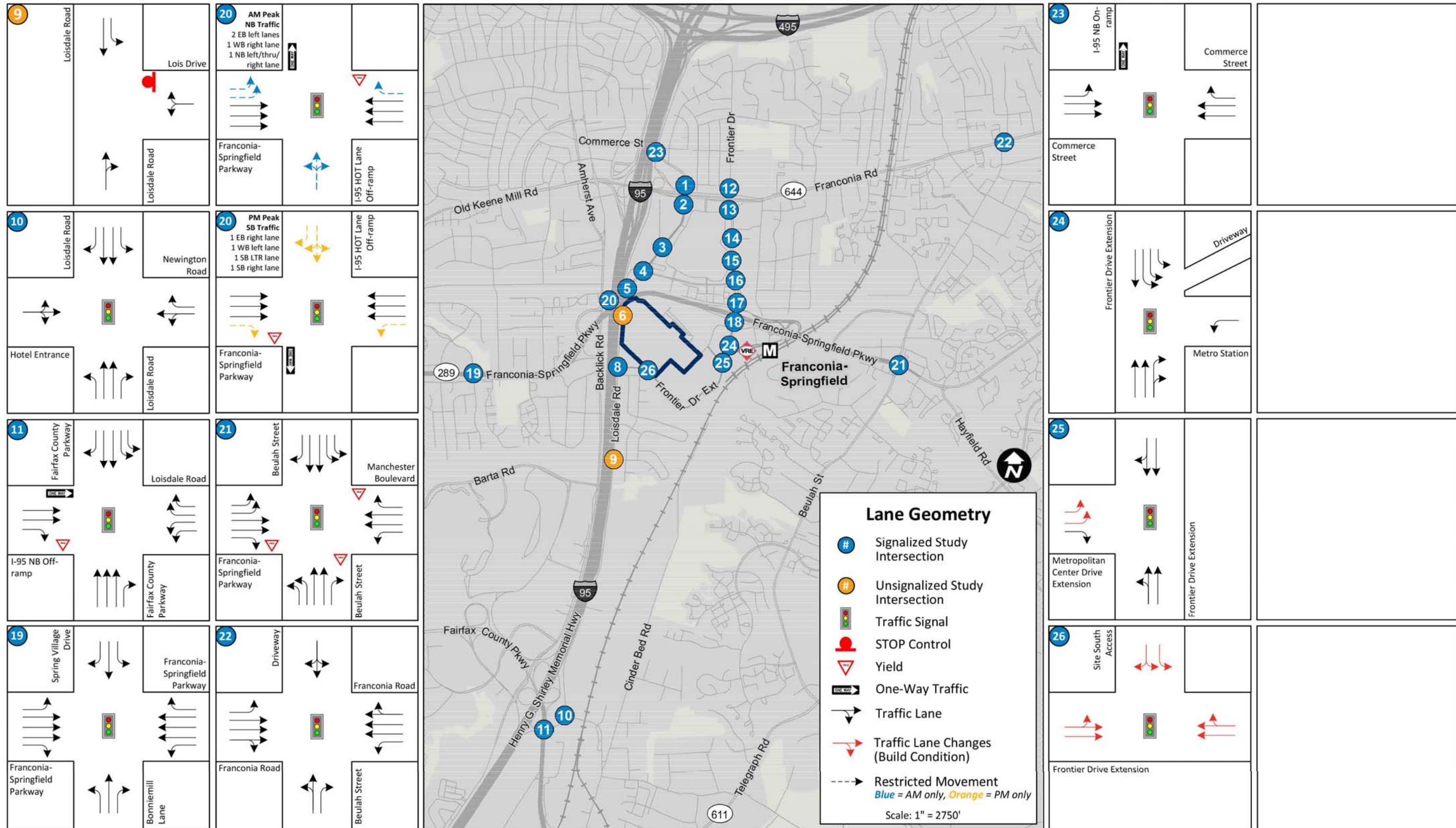
Note: Intersection #23 is analyzed only during the PM peak hour.

Figure 5-7: Build Condition Lane Geometry



Note: EB=Eastbound, WB=Westbound, NB=Northbound, SB=Southbound. Intersection #20 operates with a different lane configuration during the AM and PM peak hours.

Figure 5-7: Build Condition Lane Geometry (continued)



Note: EB=Eastbound, WB=Westbound, NB=Northbound, SB=Southbound. Intersection #20 operates with a different lane configuration during the AM and PM peak hours.

5.8.5 Build Condition Operations Analysis

Synchro™ was used to calculate the vehicle delay and LOS operation based on the HCM 2000 method for each study area intersection.

5.8.5.1 Signalized Intersection Operations Analysis

Based on the Synchro™ signalized intersection analysis, the majority of study intersections would operate at acceptable conditions during the morning and afternoon peak hours. However, unlike in the No-build Condition, the intersections of Frontier Drive and Franconia-Springfield Parkway (Westbound) and Frontier Drive and Franconia-Springfield Parkway (Eastbound) would operate at LOS F during the AM peak hour. As with the No-build condition, the intersection of Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street would operate at LOS F during both the AM and PM peak hours. These are the only intersections within the study area that would operate under failing conditions (LOS F) during a peak hour in 2020.

The following approaches to intersections would operate under unacceptable conditions (LOS E or LOS F) during the peak hour (average control delay exceeds 55 seconds):

- Loisdale Road/Commerce Street and Franconia Road (Westbound) (Intersection #1)
 - Westbound Franconia Road (left turns) during both the AM and PM peak hours
- Loisdale Road/Commerce Street and Franconia Road (Eastbound) (Intersection #2)
 - Northbound Loisdale Road (overall) during the PM peak hour
- Loisdale Road and Ramp from NB I-95/Spring Mall Drive (Intersection #4)
 - Westbound Spring Mall Drive (overall) during the AM peak hour
- Loisdale Road and Frontier Drive Extension (Intersection # 8)
 - Southbound Loisdale Drive (overall) during the AM peak hour
 - Westbound Spring Center Drive (overall) during the PM peak hour
- Loisdale Road and Hotel Entrance/Newington Road (Intersection # 10)
 - Westbound Newington Road (combined left and through movements) during the PM peak hour.
- Loisdale Road/I-95 (N) Ramp C and D and Fairfax County Parkway (Intersection # 11)
 - Eastbound I-95 Northbound off-ramp (overall), westbound Loisdale Road (overall), and southbound Fairfax County Parkway (left turns) during the AM peak hour
 - Eastbound I-95 Northbound off-ramp (through movements), westbound Loisdale Road (overall), and southbound Fairfax County Parkway (left turns) during the PM peak hour
- Frontier Drive and Franconia Road (Eastbound) (Intersection # 13)
 - Northbound Frontier Drive (overall) during the PM peak hour
- Frontier Drive and Best Buy/Springfield Mall Parking Lot Entrance (Intersection # 14)
 - Eastbound Springfield Mall parking lot entrance (left turns), westbound Best Buy entrance (overall), and northbound and southbound Frontier Drive (left turns on both approaches) during the AM peak hour
 - Northbound Frontier Road (left turns) at the same intersection during the PM peak hour.
- Frontier Drive and Home Depot/Springfield Mall Garage Entrance (Intersection # 15)
 - Eastbound Springfield Mall garage entrance (left and through movements), westbound Home Depot entrance (overall), and northbound and southbound Frontier Drive (left turns on both approaches) during the AM peak hour
 - Northbound and southbound Frontier Drive (left turns on both approaches) during the PM peak hour
- Frontier Drive and Spring Mall Drive (Intersection # 16)
 - Westbound Spring Mall Road (overall) and southbound Frontier Drive (left turns) during the AM peak hour
- Frontier Drive and Franconia-Springfield Parkway (Westbound) (Intersection # 17)

- Southbound Frontier Drive (overall) during the AM peak hour
- Frontier Drive and Franconia-Springfield Parkway (Eastbound) (Intersection # 18)
 - Eastbound Franconia-Springfield Parkway (Eastbound) off-ramp (overall) during the AM peak hour
- Franconia-Springfield Parkway and Spring Village Drive/Bonniemill Lane (Intersection # 19)
 - Eastbound Franconia-Springfield Parkway (left turns), westbound Franconia-Springfield Parkway (left turns), northbound Bonniemill Lane (overall), and southbound Spring Village Drive (overall) during both the AM and PM peak hours.
- Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street (Intersection # 21)
 - Eastbound Franconia-Springfield Parkway (left turns), westbound Manchester Boulevard (overall), and northbound and southbound Beulah Street (both overall) during the AM peak hour
 - Eastbound Franconia-Springfield Parkway (overall), westbound Manchester Boulevard (overall), and northbound and southbound Beulah Street (both overall) at the same intersection during the PM peak hour
- Franconia Road and Beulah Street (Intersection # 22)
 - Westbound Franconia Road (left turns) and the southbound Driveway opposite Beulah Street (overall) during the AM peak hour
 - Eastbound Franconia Road (overall), westbound Franconia Road (left turns), northbound Beulah Street (left and through movements), and the southbound driveway opposite Beulah Street (overall) during the PM peak hour

5.8.5.2 *Unsignalized Intersection Operations Analysis*

Based on the Synchro™ unsignalized intersection analysis, most of the unsignalized intersection minor approaches in the study area would operate at acceptable conditions during the morning and afternoon peak hours. The intersection of Loisdale Road and the northern entrance road to the site would have a failing minor approach for the westbound (overall) approach for the northern entrance road during the PM peak hour. Further, while the intersection of Loisdale Road and the southern entrance road to the site failed in the No-build condition, it would not exist in the Build Condition.

5.8.5.3 *Complete Intersection Operations Analysis*

This section summarizes the differences in LOS impacts between the Build Condition and the No-build Condition by quantifying the change in intersection operation failures. Following the summary, this section also includes the complete results of the operations analysis in figures and a table.

Based on the Synchro™ signalized intersection analysis, a total of 15 signalized intersections and 1 unsignalized intersection would experience unacceptable conditions for one or more turning movements. Compared to the No-build Condition, the Build Condition would have two more intersections failing during the AM peak hour and there would no change in the number of intersections failing during the PM peak hour. For the Build Condition in the AM peak hour, there are two intersections that passed overall but would now fail, 23 that would not change, and zero that were failing but would now pass, compared to the No-build Condition. For the Build Condition in the PM peak hour, there are zero intersections that passed overall but would now fail, 25 that would not change, and zero that were failing but would now pass, compared to the No-build Condition.

Table 5-24 provides a summary of the number of intersections that meet the following criteria for the overall directional approach that would change between the Build Condition and the No-build Condition:

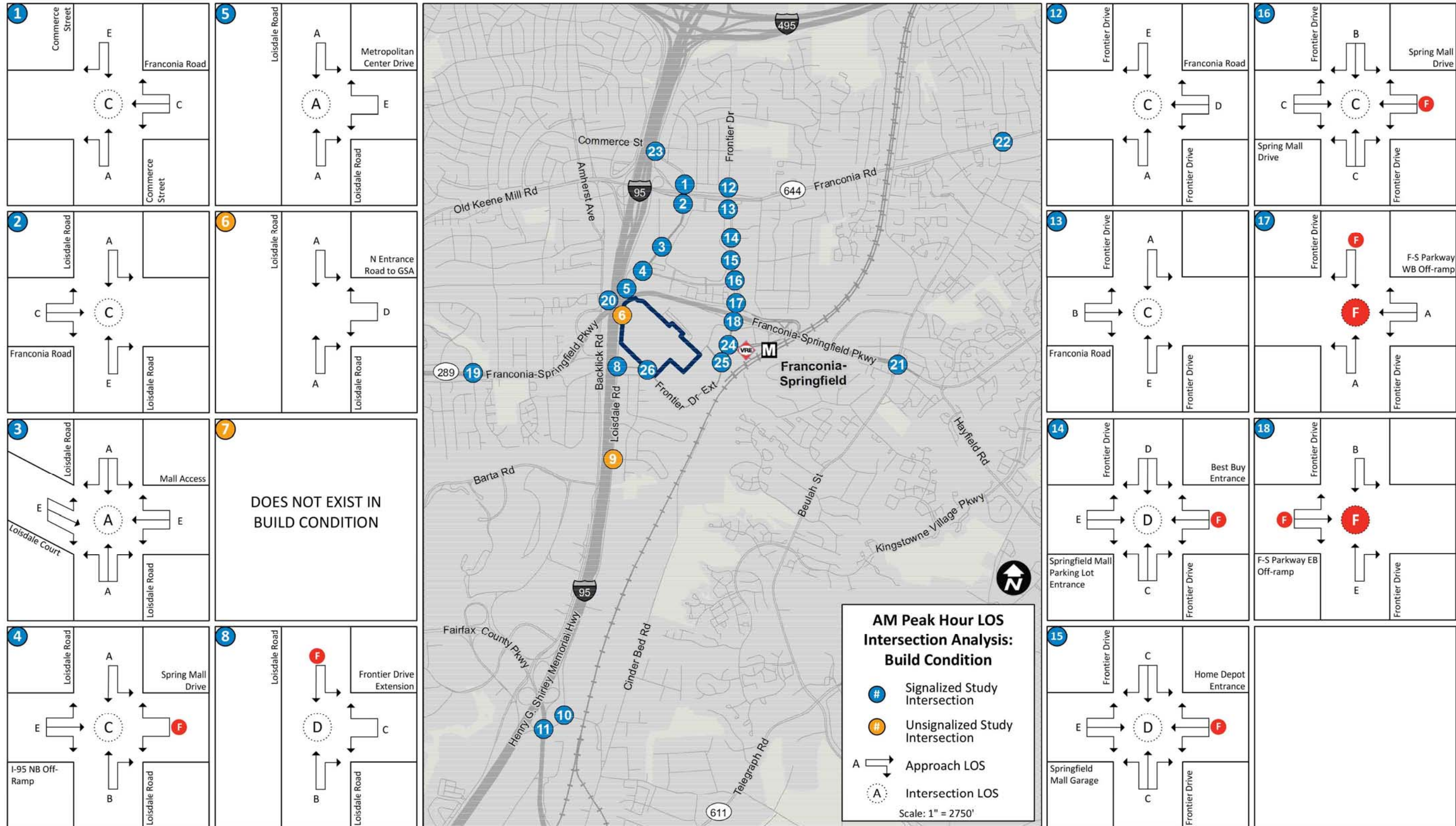
Table 5-24: Intersection Operations Summary Comparing No-build Condition to Build Condition

Type of Change Between Conditions	AM	PM
New Failing Approach	2	5
Additional Failing Approaches	0	0
No Change	23	20
Fewer Failing Approaches	0	0
No Failing Approaches	0	0
Total Signalized and Unsignalized Intersections	25	25

The average LOS for the various approaches to the intersections and the overall intersection LOS grades for the Build Condition are shown in figures 5-8 and 5-9 for the AM and PM peak hours, respectively. Table 5-25 shows the results of the LOS capacity analysis and the intersection projected delay under the No-build Condition compared to the Build Condition during the AM and PM peak hours.

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Figure 5-8: Build Condition Intersection LOS for AM Peak Hour



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at unacceptable conditions (LOS F and, depending on intersection, also LOS E; see report text for more details). Intersection #23 is analyzed only during the PM peak hour.

Figure 5-8: Build Condition Intersection LOS for AM Peak Hour (continued)

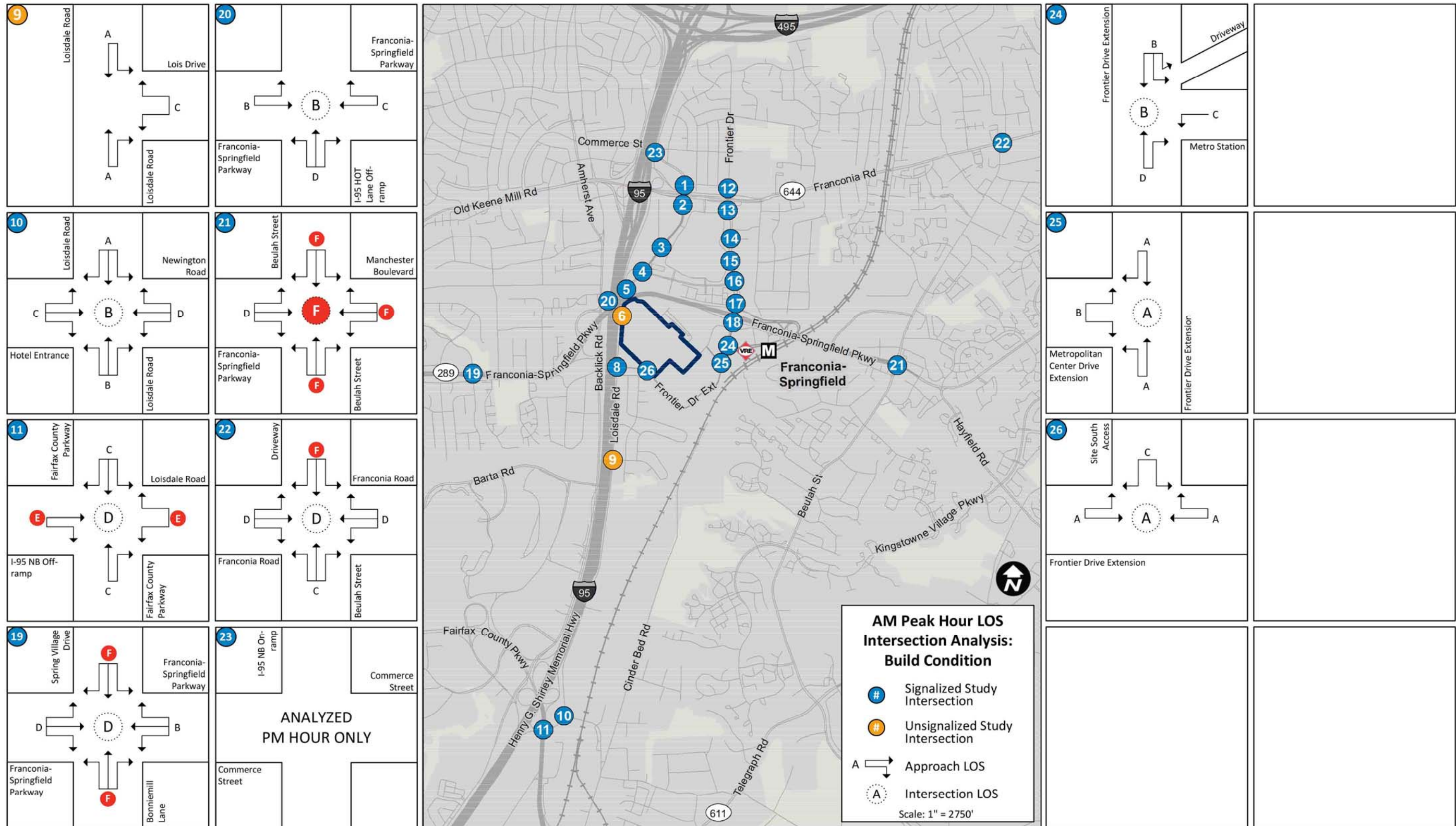
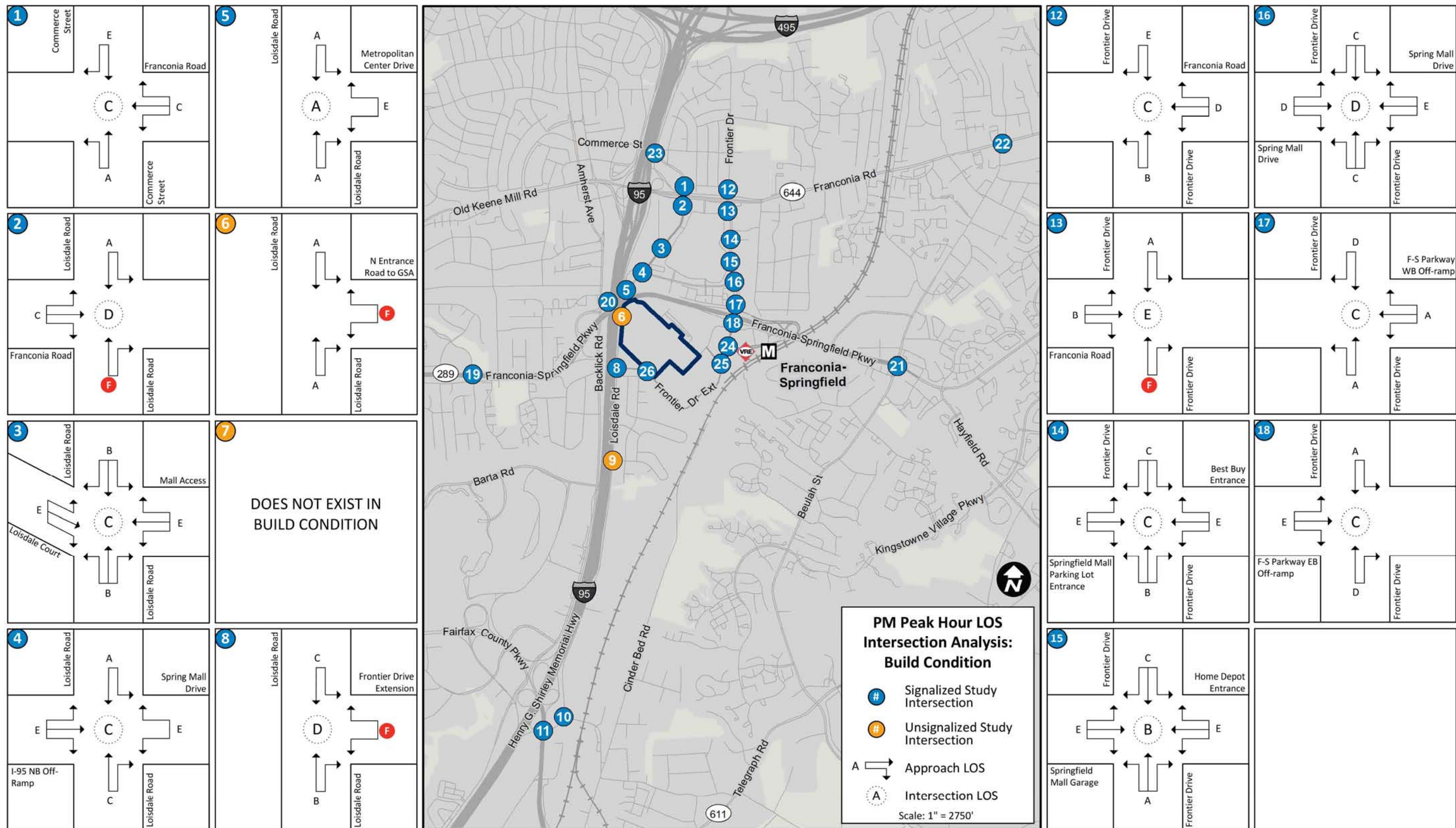
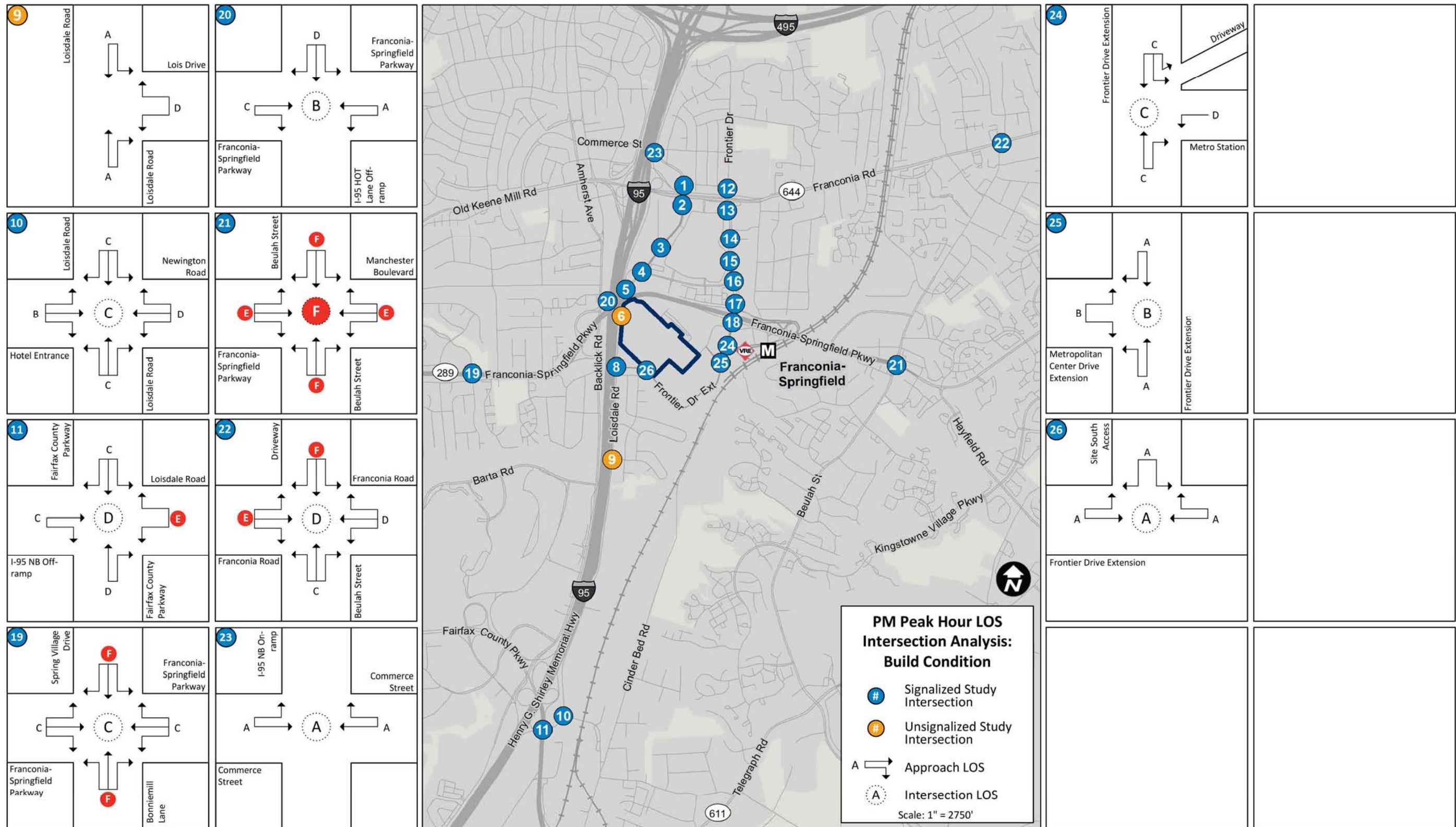


Figure 5-9: Build Condition Intersection LOS for PM Peak Hour



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at unacceptable conditions (LOS F and, depending on intersection, also LOS E; see report text for more details). Intersection #23 is analyzed only during the PM peak hour.

Figure 5-9: Build Condition Intersection LOS for PM Peak Hour (continued)



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at unacceptable conditions (LOS F and, depending on intersection, also LOS E; see report text for more details). Intersection #23 is analyzed only during the PM peak hour.

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
1	Loisdale Road/Commerce Street & Franconia Road (Westbound) (Signalized)													
	WB (Franconia Rd)	L	92.8	F		90.8	F		90.9	F		83.0	F	
	WB (Franconia Rd)	T	29.8	C		32.3	C		31.1	C		38.0	D	
	WB (Franconia Rd)	R	1.5	A		0.8	A		1.5	A		1.1	A	
	WB Overall (Franconia Rd)		20.8	C		25.4	C		20.8	C		27.0	C	
	NB (Commerce St)	L	0.7	A		2.4	A		0.7	A		4.2	A	
	NB (Commerce St)	T	1.5	A		1.9	A		1.5	A		1.7	A	
	NB Overall (Commerce St)		1.1	A		2.3	A		1.1	A		3.4	A	
	SB (Commerce St)	T	70.6	E		73.8	E		69.5	E		73.9	E	
	SB (Commerce St)	R	68.1	E		64.0	E		66.8	E		64.0	E	
	SB Overall (Commerce St)		69.5	E		71.1	E		68.4	E		71.1	E	
	Overall		24.0	C	Pass	31.1	C	Pass	23.9	C	Pass	30.6	C	Pass
2	Loisdale Road/Commerce Street & Franconia Road (Eastbound) (Signalized)													
	EB (Franconia Rd)	L	72.9	E		76.4	E		72.9	E		76.4	E	
	EB (Franconia Rd)	T	38.0	D		52.0	D		41.5	D		52.3	D	
	EB (Franconia Rd)	R	0.7	A		4.9	A		1.2	A		5.1	A	
	EB Overall (Franconia Rd)		23.1	C		21.7	C		25.0	C		22.1	C	
	NB (Loisdale Rd)	T	70.5	E		72.1	E		71.1	E		100.1	F	
	NB (Loisdale Rd)	R	63.4	E		55.4	E		63.3	E		55.4	E	
	NB Overall (Loisdale Rd)		69.0	E		69.5	E		69.5	E		93.9	F	
	SB (Loisdale Rd)	L	2.7	A		0.1	A		2.9	A		0.1	A	
	SB (Loisdale Rd)	T	2.7	A		0.2	A		2.5	A		0.2	A	
	SB Overall (Loisdale Rd)		2.7	A		0.2	A		2.7	A		0.2	A	
	Overall		35.7	D	Pass	32.1	C	Pass	34.9	C	Pass	42.3	D	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
3	Loisdale Road & Loisdale Court/Mall Access (Signalized)													
	EB (Loisdale Court)	L	74.0	E		76.0	E		74.0	E		76.0	E	
	EB (Loisdale Court)	LT	74.1	E		74.0	E		74.1	E		74.0	E	
	EB (Loisdale Court)	R	65.6	E		53.5	D		65.6	E		53.5	D	
	EB Overall (Loisdale Court)		72.0	E		68.3	E		72.0	E		68.3	E	
	WB (Mall Access)	L	67.6	E		65.1	E		67.6	E		65.1	E	
	WB (Mall Access)	T	67.2	E		53.8	D		67.2	E		53.8	D	
	WB (Mall Access)	R	66.5	E		53.9	D		66.5	E		53.9	D	
	WB Overall (Mall Access)		66.9	E		57.7	E		66.9	E		57.7	E	
	NB (Loisdale Rd)	L	2.1	A		11.9	B		2.2	A		15.6	B	
	NB (Loisdale Rd)	T	3.4	A		12.0	B		3.4	A		18.6	B	
	NB (Loisdale Rd)	R	0.0	A		0.0	A		0.0	A		0.0	A	
	NB Overall (Loisdale Rd)		3.1	A		11.3	B		3.2	A		17.4	B	
	SB (Loisdale Rd)	L	3.2	A		7.0	A		3.2	A		8.2	A	
	SB (Loisdale Rd)	T	5.4	A		13.3	B		5.7	A		13.3	B	
	SB (Loisdale Rd)	R	4.9	A		10.0	B		4.9	A		10.0	B	
	SB Overall (Loisdale Rd)		5.0	A		11.6	B		5.3	A		12.0	B	
	Overall		9.1	A	Pass	21.9	C	Pass	8.8	A	Pass	23.5	C	Pass
4	Loisdale Road & Ramp from NB I-95/Spring Mall Drive (Signalized)													
	EB (Ramp from NB I-95)	L	66.4	E		69.0	E		60.8	E		69.0	E	
	EB (Ramp from NB I-95)	T	67.8	E		68.8	E		66.3	E		68.8	E	
	EB (Ramp from NB I-95)	R	59.1	E		61.4	E		56.2	E		61.5	E	
	EB Overall (Ramp from NB I-95)		66.4	E		68.8	E		62.8	E		68.7	E	
	WB (Spring Mall Dr)	L	17.4	B		68.9	E		16.6	B		66.8	E	
	WB (Spring Mall Dr)	R	119.4	F		52.5	D		140.8	F		48.6	D	
	WB Overall (Spring Mall Dr)		87.8	F		60.1	E		112.9	F		57.0	E	
	NB (Loisdale Rd)	TR	14.9	B		20.5	C		16.7	B		26.3	C	
	NB (Loisdale Rd)	R	8.5	A		16.2	B		9.5	A		48.5	D	
	NB Overall (Loisdale Rd)		13.8	B		19.8	B		15.6	B		28.7	C	
	SB (Loisdale Rd)	L	4.2	A		5.5	A		4.8	A		7.1	A	
	SB (Loisdale Rd)	T	4.6	A		4.1	A		6.1	A		6.8	A	
	SB Overall (Loisdale Rd)		4.5	A		4.7	A		5.8	A		6.9	A	
	Overall		32.9	C	Pass	23.7	C	Pass	33.9	C	Pass	26.5	C	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
5	Loisdale Road & Metropolitan Center Drive (Signalized)													
	WB (Metropolitan Center Dr)	L	69.0	E		71.6	E		69.0	E		71.6	E	
	WB (Metropolitan Center Dr)	R	68.2	E		69.2	E		68.2	E		69.2	E	
	WB Overall (Metropolitan Center Dr)		68.3	E		69.8	E		68.3	E		69.8	E	
	NB (Loisdale Rd)	T	2.2	A		1.8	A		2.2	A		1.9	A	
	NB (Loisdale Rd)	R	1.6	A		1.4	A		1.6	A		1.4	A	
	NB Overall (Loisdale Rd)		2.2	A		1.8	A		2.2	A		1.9	A	
	SB (Loisdale Rd)	L	0.4	A		0.9	A		0.6	A		1.8	A	
	SB (Loisdale Rd)	T	0.7	A		0.8	A		1.0	A		1.2	A	
	SB Overall (Loisdale Rd)		0.7	A		0.8	A		1.0	A		1.3	A	
	Overall		6.7	A	Pass	4.1	A	Pass	6.0	A	Pass	4.2	A	Pass
6	Loisdale Road & Northern Entrance Road to GSA Facility (Access to Building A, 66808 & 6610 Loisdale Road) (TWSC)													
	WB (N Ent Rd to GSA)	L	31.1	D		0.0	A		43.1	E		^	F	
	WB (N Ent Rd to GSA)	R	13.6	B		12.2	B		14.0	B		14.2	B	
	WB Overall (N Ent Rd to GSA)		16.5	C		12.2	B		28.6	D		^	F	
	SB (Loisdale Rd)	L	9.3	A		8.6	A		9.3	A		9.3	A	
	SB Overall (Loisdale Rd)		0.5	-		0.0	-		0.0	-		0.0	-	
	Overall		0.3	-	Pass	0.1	-	Pass	0.1	-	Pass	11.4	-	Pass
7	Loisdale Road & Southern Entrance Road to GSA Facility (Access to Building B, 7000 Loisdale Road) (TWSC) ^a													
	WB (S Ent Rd to GSA)	L	51.4	F		41.1	E		-	-		-	-	
	WB (S Ent Rd to GSA)	R	13.3	B		11.2	B		-	-		-	-	
	WB Overall (S Ent Rd to GSA)		20.2	C		17.7	C		-	-		-	-	
	SB (Loisdale Rd)	L	10.2	B		8.3	A		-	-		-	-	
	SB Overall (Loisdale Rd)		2.1	-		0.1	-		-	-		-	-	
	Overall		1.6	-	Pass	0.9	-	Pass	-	-	-	-	-	
8	Loisdale Road & Frontier Drive Extension (Signalized)													
	WB (Frontier Dr Ext)	L	31.4	C		51.1	D		28.0	C		179.4	F	
	WB (Frontier Dr Ext)	R	28.1	C		27.5	C		25.9	C		26.9	C	
	WB Overall (Frontier Dr Ext)		30.8	C		47.5	D		27.0	C		122.8	F	
	NB (Loisdale Rd)	T	11.8	B		13.1	B		16.2	B		15.1	B	
	NB (Loisdale Rd)	R	8.1	A		9.9	A		10.6	B		11.3	B	
	NB Overall (Loisdale Rd)		10.5	B		12.7	B		14.0	B		14.7	B	
	SB (Loisdale Rd)	L	5.6	A		7.0	A		144.0	F		8.1	A	
	SB (Loisdale Rd)	T	3.4	A		22.2	C		4.2	A		24.6	C	
	SB Overall (Loisdale Rd)		3.8	A		21.4	C		82.2	F		23.4	C	
	Overall		9.2	A	Pass	23.8	C	Pass	43.2	D	Pass	53.9	D	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition						
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	
9	Loisdale Road & Lois Drive (TWSC)														
	WB (Lois Drive Dr)	LR	16.7	C		21.7	C		17.1	C		25.5	D		
	WB Overall (Lois Drive Dr)		16.7	C	Pass	21.7	A	Pass	17.1	C	Pass	25.5	D	Pass	
	SB (Loisdale Rd)	L	9.1	A		8.3	C		9.2	A		8.3	A		
	SB Overall (Loisdale Rd)		0.3	-	Pass	0.1	-	Pass	0.3	-	Pass	0.1	-	Pass	
	Overall		0.7	-	Pass	0.3	-	Pass	0.7	-	Pass	0.3	-	Pass	
10	Loisdale Road & Hotel Entrance/Newington Road (Signalized)														
	EB (Hotel Entrance)	LTR	30.7	C		18.0	B		30.7	C		18.0	B		
	EB Overall (Hotel Entrance)		30.7	C	Pass	18.0	B	Pass	30.7	C	Pass	18.0	B	Pass	
	WB (Newington Rd)	LT	46.1	D		59.0	E		46.1	D		59.0	E		
	WB (Newington Rd)	R	28.4	C		18.4	B		28.4	C		18.4	B		
	WB Overall (Newington Rd)		38.8	D	Pass	50.1	D	Pass	38.8	D	Pass	50.1	D	Pass	
	NB (Loisdale Rd)	L	8.4	A		18.6	B		8.3	A		19.3	B		
	NB (Loisdale Rd)	T	9.4	A		19.4	B		9.8	A		19.5	B		
	NB (Loisdale Rd)	R	14.8	B		31.7	C		15.0	B		31.7	C		
	NB Overall (Loisdale Rd)		11.1	B	Pass	23.6	C	Pass	11.4	B	Pass	23.7	C	Pass	
	SB (Loisdale Rd)	L	7.6	A		27.5	C		7.7	A		27.5	C		
	SB (Loisdale Rd)	T	8.5	A		25.6	C		8.6	A		29.0	C		
	SB (Loisdale Rd)	R	8.0	A		17.9	B		8.0	A		17.9	B		
	SB Overall (Loisdale Rd)		8.2	A	Pass	26.0	C	Pass	8.2	A	Pass	28.6	C	Pass	
	Overall		16.7	B	Pass	31.6	C	Pass	16.8	B	Pass	32.6	C	Pass	
11	Loisdale Road/I-95 (N) Ramp C & D & Fairfax County Parkway (Signalized)														
	EB (I-95 Northbound Off-Ramp)	T	117.0	F		84.6	F		117.0	F		84.6	F		
	EB (I-95 Northbound Off-Ramp)	R	0.3	A		0.2	A		0.3	A		0.2	A		
	EB Overall (I-95 Northbound Off-Ramp)		55.5	E	Fail	27.3	C	Pass	55.5	E	Fail	27.3	C	Pass	
	WB (Loisdale Rd)	L	125.3	F		74.5	E		126.7	F		76.3	E		
	WB (Loisdale Rd)	R	43.1	D		37.1	D		43.0	D		48.5	D		
	WB Overall (Loisdale Rd)		69.5	E	Fail	48.1	D	Pass	70.1	E	Fail	56.3	E	Fail	
	NB (Fairfax County Pkwy)	T	29.6	C		49.3	D		29.6	C		49.3	D		
	NB (Fairfax County Pkwy)	R	24.3	C		9.5	A		24.9	C		9.5	A		
	NB Overall (Fairfax County Pkwy)		28.7	C	Pass	46.2	D	Pass	28.7	C	Pass	46.2	D	Pass	
	SB (Fairfax County Pkwy)	L	84.0	F		97.1	F		83.9	F		96.8	F		
	SB (Fairfax County Pkwy)	T	30.6	C		23.4	C		30.6	C		23.4	C		
	SB (Fairfax County Pkwy)	R	0.8	A		1.0	A		0.8	A		1.0	A		
	SB Overall (Fairfax County Pkwy)		31.2	C	Pass	24.5	C	Pass	31.2	C	Pass	24.4	C	Pass	
	Overall		35.7	D	Pass	37.7	D	Pass	35.7	D	Pass	39.9	D	Pass	

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
12	Frontier Drive & Franconia Road (Westbound) (Signalized)													
	WB (Franconia Rd)	L	73.3	E		64.3	E		73.9	E		64.4	E	
	WB (Franconia Rd)	TR	44.2	D		35.3	D		45.1	D		35.3	D	
	WB Overall (Franconia Rd)		48.0	D		41.2	D		49.6	D		41.4	D	
	NB (Frontier Dr)	L	6.1	A		3.5	A		6.1	A		18.8	B	
	NB (Frontier Dr)	T	2.6	A		1.5	A		2.6	A		1.0	A	
	NB Overall (Frontier Dr)		5.9	A		3.3	A		5.9	A		17.3	B	
	SB (Frontier Dr)	TR	73.1	E		65.7	E		71.5	E		65.9	E	
	SB Overall (Frontier Dr)		73.1	E		65.7	E		71.5	E		65.9	E	
	Overall		30.7	C	Pass	24.6	C	Pass	31.5	C	Pass	29.4	C	Pass
13	Frontier Drive & Franconia Road (Eastbound) (Signalized)													
	EB (Franconia Rd)	L	46.1	D		49.8	D		54.4	D		49.5	D	
	EB (Franconia Rd)	T	26.7	C		30.4	C		32.7	C		30.5	C	
	EB (Franconia Rd)	R	0.6	A		0.6	A		1.5	A		0.7	A	
	EB Overall (Franconia Rd)		12.5	B		18.2	B		11.6	B		18.0	B	
	NB (Frontier Dr)	T	67.1	E		43.6	D		67.1	E		113.5	F	
	NB (Frontier Dr)	R	54.9	D		76.0	E		54.9	D		74.7	E	
	NB Overall (Frontier Dr)		64.9	E		51.3	D		64.9	E		106.0	F	
	SB (Frontier Dr)	LT	3.3	A		2.9	A		2.9	A		1.9	A	
	SB Overall (Frontier Dr)		3.3	A		2.9	A		2.9	A		1.9	A	
	Overall		38.5	D	Pass	31.5	C	Pass	34.5	C	Pass	62.3	E	Pass
14	Frontier Drive & Best Buy/Springfield Mall Lot Entrance (Signalized)													
	EB (Springfield Mall Lot Ent)	L	80.2	F		79.1	E		80.2	F		79.1	E	
	EB (Springfield Mall Lot Ent)	LTR	77.1	E		67.7	E		77.1	E		67.7	E	
	EB Overall (Springfield Mall Parking Lot E		78.1	E		72.7	E		78.1	E		72.7	E	
	WB (Best Buy Ent)	L	207.5	F		77.3	E		207.5	F		77.3	E	
	WB (Best Buy Ent)	TR	22.6	C		67.4	E		22.6	C		67.4	E	
	WB Overall (Best Buy Ent)		148.2	F		72.2	E		148.2	F		72.2	E	
	NB (Frontier Dr)	L	105.9	F		101.9	F		106.0	F		102.8	F	
	NB (Frontier Dr)	T	29.4	C		6.9	A		29.4	C		6.1	A	
	NB (Frontier Dr)	R	37.2	D		16.9	B		37.2	D		11.2	B	
	NB Overall (Frontier Dr)		32.1	C		17.6	B		32.1	C		14.1	B	
	SB (Frontier Dr)	L	93.3	F		69.9	E		93.3	F		69.9	E	
	SB (Frontier Dr)	T	43.6	D		15.7	B		50.0	D		15.5	B	
	SB (Frontier Dr)	R	37.4	D		35.4	D		37.4	D		35.0	C	
	SB Overall (Frontier Dr)		46.8	D		26.6	C		51.5	D		26.1	C	
	Overall		41.8	D	Pass	30.8	C	Pass	44.6	D	Pass	26.9	C	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
15	Frontier Drive & Home Depot/Springfield Mall Garage Entrance (Signalized)													
	EB (Springfield Mall Garage Ent)	LT	80.6	F		76.7	E		80.6	F		76.7	E	
	EB (Springfield Mall Garage Ent)	R	74.1	E		74.1	E		74.1	E		74.1	E	
	EB Overall (Springfield Mall Garage Ent)		76.7	E		74.9	E		76.7	E		74.9	E	
	WB (Home Depot Ent)	LTR	247.0	F		75.3	E		247.0	F		75.3	E	
	WB Overall (Home Depot Ent)		247.0	F		75.3	E		247.0	F		75.3	E	
	NB (Frontier Dr)	L	212.1	F		87.0	F		212.2	F		83.5	F	
	NB (Frontier Dr)	T	20.4	C		5.0	A		20.4	C		4.9	A	
	NB (Frontier Dr)	R	6.2	A		2.6	A		6.2	A		1.1	A	
	NB Overall (Frontier Dr)		20.7	C		6.2	A		20.7	C		5.6	A	
	SB (Frontier Dr)	L	92.2	F		81.7	F		86.9	F		81.6	F	
	SB (Frontier Dr)	T	8.6	A		8.2	A		22.7	C		8.5	A	
	SB (Frontier Dr)	R	0.0	A		0.0	A		0.0	A		0.0	A	
	SB Overall (Frontier Dr)		21.1	C		21.5	C		28.5	C		21.4	C	
	Overall		37.3	D	Pass	19.8	B	Pass	38.0	D	Pass	17.4	B	Pass
16	Frontier Drive & Spring Mall Drive (Signalized)													
	EB (Spring Mall Dr)	L	54.3	D		57.2	E		58.2	E		57.8	E	
	EB (Spring Mall Dr)	LT	54.4	D		57.2	E		58.3	E		57.8	E	
	EB (Spring Mall Dr)	R	11.8	B		39.1	D		12.4	B		39.2	D	
	EB Overall (Spring Mall Dr)		20.5	C		41.8	D		20.8	C		42.1	D	
	WB (Spring Mall Dr)	LT	99.8	F		76.8	E		99.8	F		76.8	E	
	WB (Spring Mall Dr)	R	62.3	E		56.7	E		62.3	E		56.6	E	
	WB Overall (Spring Mall Dr)		84.8	F		69.6	E		84.8	F		69.6	E	
	NB (Frontier Dr)	L	69.3	E		67.4	E		69.1	E		62.4	E	
	NB (Frontier Dr)	T	14.6	B		24.4	C		14.6	B		26.2	C	
	NB (Frontier Dr)	R	11.0	B		16.6	B		11.0	B		17.6	B	
	NB Overall (Frontier Dr)		27.1	C		70.3	E		26.3	C		33.9	C	
	SB (Frontier Dr)	L	92.1	F		70.3	E		96.5	F		69.4	E	
	SB (Frontier Dr)	T	6.3	A		27.1	C		8.0	A		26.8	C	
	SB (Frontier Dr)	R	18.4	B		33.4	C		17.9	B		33.0	C	
	SB Overall (Frontier Dr)		9.9	A		29.7	C		10.2	B		29.3	C	
	Overall		22.8	C	Pass	38.4	D	Pass	21.0	C	Pass	37.0	D	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
17	Frontier Drive & Franconia-Springfield Parkway (Westbound) (Signalized)													
	WB (F-S Pkwy WB Off-ramp)	L	51.5	D		75.3	E		45.7	D		75.3	E	
	WB (F-S Pkwy WB Off-ramp)	LT	51.4	D		75.1	E		45.7	D		75.4	E	
	WB (F-S Pkwy WB Off-ramp)	R	2.2	A		4.4	A		2.1	A		4.4	A	
	WB Overall (F-S Pkwy WB Off-ramp)		6.1	A		7.9	A		7.1	A		8.0	A	
	NB (Frontier Dr)	L	1.2	A		4.8	A		1.2	A		1.2	A	
	NB (Frontier Dr)	T	3.0	A		9.9	A		3.7	A		4.1	A	
	NB Overall (Frontier Dr)		3.0	A		9.6	A		3.6	A		3.7	A	
	SB (Frontier Dr)	T	69.2	E		21.7	C		350.3	F		35.1	D	
	SB (Frontier Dr)	R	44.2	D		25.8	C		55.6	E		48.4	D	
	SB Overall (Frontier Dr)		66.3	E		23.3	C		326.6	F		40.4	D	
	Overall		31.3	C	Pass	15.5	B	Pass	167.4	F	Fail	20.1	C	Pass
18	Frontier Drive & Franconia-Springfield Parkway (Eastbound) (Signalized)													
	EB (F-S Pkwy EB Off-ramp)	L	30.7	C		82.1	F		42.5	D		68.9	E	
	EB (F-S Pkwy EB Off-ramp)	LT	30.8	C		82.8	F		42.6	D		69.5	E	
	EB (F-S Pkwy EB Off-ramp)	R	121.6	F		61.3	E		361.1	F		58.2	E	
	EB Overall (F-S Pkwy EB Off-ramp)		87.0	F		74.2	E		253.0	F		64.8	E	
	NB (Frontier Dr)	T	49.4	D		58.4	E		58.3	E		50.5	D	
	NB (Frontier Dr)	R	48.8	D		55.4	E		57.5	E		42.4	D	
	NB Overall (Frontier Dr)		49.3	D		57.9	E		58.1	E		49.7	D	
	SB (Frontier Dr)	L	1.1	A		1.6	A		0.6	A		3.0	A	
	SB (Frontier Dr)	T	5.4	A		1.0	A		19.0	B		1.6	A	
	SB Overall (Frontier Dr)		4.1	A		1.4	A		14.9	B		2.5	A	
	Overall		47.6	D	Pass	32.1	C	Pass	122.3	F	Fail	33.2	C	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
19	Franconia-Springfield Parkway & Spring Village Drive/Bonniemill Lane (Signalized)													
	EB (Franconia-Springfield Pkwy)	L	160.7	F		140.4	F		160.7	F		140.4	F	
	EB (Franconia-Springfield Pkwy)	T	43.8	D		20.4	C		53.2	D		20.4	C	
	EB (Franconia-Springfield Pkwy)	R	6.5	A		15.3	B		6.5	A		15.3	B	
	EB Overall (Franconia-Springfield Pkwy)		44.8	D	Pass	22.7	C	Pass	54.0	D	Pass	22.8	C	Pass
	WB (Franconia-Springfield Pkwy)	L	272.2	F		106.7	F		272.2	F		106.7	F	
	WB (Franconia-Springfield Pkwy)	T	8.2	A		19.2	B		8.2	A		21.2	C	
	WB (Franconia-Springfield Pkwy)	R	7.2	A		6.3	A		7.2	A		6.3	A	
	WB Overall (Franconia-Springfield Pkwy)		19.8	B	Pass	23.3	C	Pass	19.7	B	Pass	25.0	C	Pass
	NB (Bonniemill Ln)	L	123.1	F		86.9	F		123.1	F		86.9	F	
	NB (Bonniemill Ln)	T	121.2	F		86.3	F		121.2	F		86.3	F	
	NB (Bonniemill Ln)	R	171.6	F		86.8	F		171.6	F		86.8	F	
	NB Overall (Bonniemill Ln)		166.2	F	Fail	86.8	F	Fail	166.2	F	Fail	86.8	F	Fail
	SB (Spring Village Dr)	L	148.2	F		117.3	F		148.2	F		117.3	F	
	SB (Spring Village Dr)	T	121.2	F		86.5	F		121.2	F		86.5	F	
	SB (Spring Village Dr)	R	121.5	F		86.8	F		121.5	F		86.8	F	
	SB Overall (Spring Village Dr)		139.6	F	Fail	105.2	F	Fail	139.6	F	Fail	105.2	F	Fail
	Overall		46.8	D	Pass	27.6	C	Pass	53.4	D	Pass	28.7	C	Pass
20	Franconia-Springfield Parkway & I-95 HOT Lane Ramps (Signalized)^b													
	EB (Franconia-Springfield Pkwy)	L (AM)	36.8	D		-	-		39.4	D		-	-	
	EB (Franconia-Springfield Pkwy)	T	10.9	B		25.7	C		11.4	B		25.7	C	
	EB (Franconia-Springfield Pkwy)	R (PM)	-	-		16.8	B		-	-		16.8	B	
	EB Overall (Franconia-Springfield Pkwy)		14.4	B	Pass	25.5	C	Pass	15.0	B	Pass	25.6	C	Pass
	WB (Franconia-Springfield Pkwy)	L (PM)	-	-		35.2	D		-	-		35.2	D	
	WB (Franconia-Springfield Pkwy)	T	21.8	C		5.7	A		21.8	C		6.2	A	
	WB (Franconia-Springfield Pkwy)	R (AM)	17.4	B		-	-		17.5	B		-	-	
	WB Overall (Franconia-Springfield Pkwy)		21.2	C	Pass	7.6	A	Pass	21.2	C	Pass	8.0	A	Pass
	NB (I-95 HOT Lane Off-ramp)	LTR (AM)	39.2	D		-	-		42.5	D		-	-	
	NB Overall (I-95 HOT Lane Off-ramp)		39.2	D	Pass	-	-	Pass	42.5	D	Pass	-	-	Pass
	SB (I-95 HOT Lane Off-ramp)	LTR (PM)	-	-		41.0	D		-	-		41.0	D	
	SB (I-95 HOT Lane Off-ramp)	R (PM)	-	-		40.1	D		-	-		40.1	D	
	SB Overall (I-95 HOT Lane Off-ramp)		-	-	Pass	40.6	D	Pass	-	-	Pass	40.6	D	Pass
	Overall		17.5	B	Pass	15.8	B	Pass	18.0	B	Pass	15.9	B	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
21	Franconia-Springfield Parkway/Manchester Boulevard & Beulah Street (Signalized)													
	EB (Franconia-Springfield Pkwy)	L	85.5	F		81.8	F		85.5	F		81.8	F	
	EB (Franconia-Springfield Pkwy)	T	36.3	D		65.6	E		36.3	D		70.7	E	
	EB (Franconia-Springfield Pkwy)	R	32.9	C		53.0	D		32.9	C		53.6	D	
	EB Overall (Franconia-Springfield Pkwy)		49.6	D	Pass	64.7	E	Fail	49.6	D	Pass	67.7	E	Fail
	WB (Manchester Blvd)	L	77.7	E		112.4	F		77.7	E		112.4	F	
	WB (Manchester Blvd)	T	83.4	F		77.9	E		90.5	F		78.5	E	
	WB (Manchester Blvd)	R	37.7	D		36.7	D		37.7	D		36.7	D	
	WB Overall (Manchester Blvd)		76.8	E	Fail	76.5	E	Fail	82.7	F	Fail	77.0	E	Fail
	NB (Beulah St)	L	168.3	F		214.3	F		168.3	F		214.3	F	
	NB (Beulah St)	T	65.8	E		78.2	E		65.8	E		78.2	E	
	NB (Beulah St)	R	48.1	D		63.0	E		48.1	D		63.0	E	
	NB Overall (Beulah St)		119.6	F	Fail	146.6	F	Fail	119.6	F	Fail	146.6	F	Fail
	SB (Beulah St)	L	73.9	E		89.5	F		73.9	E		89.5	F	
	SB (Beulah St)	T	161.6	F		201.2	F		161.6	F		201.2	F	
	SB (Beulah St)	R	79.1	E		74.9	E		79.1	E		74.9	E	
	SB Overall (Beulah St)		114.8	F	Fail	137.8	F	Fail	114.8	F	Fail	137.8	F	Fail
	Overall		84.1	F	Fail	96.9	F	Fail	85.6	F	Fail	98.1	F	Fail
22	Franconia Road & Beulah Street (Signalized)													
	EB (Franconia Rd)	L	40.7	D		39.9	D		41.4	D		40.8	D	
	EB (Franconia Rd)	TR	49.6	D		60.2	E		48.9	D		63.1	E	
	EB Overall (Franconia Rd)		49.5	D	Pass	60.0	E	Fail	48.8	D	Pass	62.9	E	Fail
	WB (Franconia Rd)	L	64.3	E		100.1	F		64.1	E		100.1	F	
	WB (Franconia Rd)	TR	18.4	B		17.5	B		18.5	B		17.5	B	
	WB Overall (Franconia Rd)		39.4	D	Pass	49.3	D	Pass	39.1	D	Pass	49.3	D	Pass
	NB (Beulah St)	LT	51.5	D		60.6	E		51.5	D		60.6	E	
	NB (Beulah St)	R	28.1	C		23.3	C		28.2	C		23.3	C	
	NB Overall (Beulah St)		31.3	C	Pass	34.4	C	Pass	31.4	C	Pass	34.4	C	Pass
	SB (Driveway)	LTR	129.3	F		164.6	F		129.3	F		164.6	F	
	SB Overall (Driveway)		129.3	F	Fail	164.6	F	Fail	129.3	F	Fail	164.6	F	Fail
	Overall		39.9	D	Pass	51.1	D	Pass	39.6	D	Pass	52.0	D	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
23	I-95 NB On-ramp & Commerce Street (Signalized) ^c													
	EB (Commerce St)	L	-	-		1.8	A		-	-		1.8	A	
	EB (Commerce St)	T	-	-		0.1	A		-	-		0.1	A	
	EB Overall (Commerce St)		-	-		0.2	A		-	-		0.2	A	
	WB (Commerce St)	T	-	-		6.1	A		-	-		6.1	A	
	WB (Commerce St)	R	-	-		5.4	A		-	-		5.8	A	
	WB Overall (Commerce St)		-	-		2.8	A		-	-		6.0	A	
	Overall		-	-	-	2.8	A	Pass	-	-	-	3.1	A	Pass
24	Frontier Drive Extension & Metro Station (Signalized)													
	WB (Metro Station)	L	31.3	C		23.4	C		29.8	C		42.2	D	
	WB Overall (Metro Station)		31.3	C		23.4	C		29.8	C		42.2	D	
	NB (Frontier Dr Ext)	T	27.1	C		22.0	C		32.7	C		22.4	C	
	NB (Frontier Dr Ext)	R	30.1	C		19.4	B		36.8	D		15.7	B	
	NB Overall (Frontier Dr Ext)		29.2	C		22.0	C		35.4	D		22.4	C	
	SB (Frontier Dr Ext) to Driveway	L	23.6	C		21.2	C		31.7	C		41.4	D	
	SB (Frontier Dr Ext)	L	14.5	B		18.2	B		18.4	B		32.5	C	
	SB (Frontier Dr Ext)	T	0.1	A		0.0	A		0.5	A		0.0	A	
	SB Overall (Frontier Dr Ext)		14.3	B		16.0	B		13.7	B		28.9	C	
	Overall		16.4	B	Pass	18.7	B	Pass	16.1	B	Pass	26.4	C	Pass
25	Frontier Drive Extension & Metropolitan Center Drive Extension ^d													
	EB (Metropolitan Center Dr Ext)	LR/L	14.8	B		13.3	B		17.8	B		10.6	B	
	EB (Metropolitan Center Dr Ext)	R	-	-		-	-		16.9	B		7.6	A	
	EB Overall (Metropolitan Center Dr Ext)		14.8	B		13.3	B		17.7	B		10.3	B	
	NB (Frontier Dr Ext)	LT	4.3	A		1.4	A		4.4	A		11.4	B	
	NB Overall (Frontier Dr Ext)		2.1	-		0.5	-		4.4	A		11.4	B	
	SB (Frontier Dr Ext)	TR	-	-		-	-		5.2	A		11.4	B	
	SB Overall (Frontier Dr Ext)		-	-		-	-		5.2	A		11.4	B	
	Overall		2.1	-	Pass	4.7	-	Pass	5.8	A	Pass	10.7	B	Pass

Table 5-25: Comparison of No-build and Build Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
26	Frontier Drive Extension & Site South Access (TWSC)													
	EB (Frontier Dr Ext)	LT	-	-		-	-		4.7	A		9.0	A	
	EB Overall (Frontier Dr Ext)		-	-		-	-		4.7	A		9.0	A	
	WB (Frontier Dr Ext)	TR	-	-		-	-		3.1	A		9.6	A	
	WB Overall (Frontier Dr Ext)		-	-		-	-		3.1	A		9.6	A	
	SB (Site South Access)	L	-	-		-	-		-	-		-	-	
	SB (Site South Access)	R	-	-		-	-		21.0	C		9.0	A	
	SB Overall (Site South Access)		-	-		-	-		21.0	C		9.0	A	
	Overall		-	-	-	-	-	-	5.6	A	Pass	9.2	A	Pass

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LOS = Level of Service

LTR = left / through / right lanes

LTR/LTR = No-Build/Build with Mitigation

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

Delays Measured in Seconds Per Vehicle.

Red cells denote intersections operating at unacceptable conditions.

^a Highway Capacity Manual unable to report accurate delay using default gap acceptance values

^a Intersection #7 would be removed for the Build Condition.

^b Intersection would continue to operate with a different lane configuration during the AM and PM peak hours.

^c Intersection is not analyzed during the AM peak hour.

^d Intersection would operate as a TWSC intersection under the No-build Condition and signalized under the Build Condition.

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5.8.6 Build Condition Queuing Analysis

Synchro™ was used to calculate the 50th percentile queue lengths, and SimTraffic™ was used to calculate the 95th percentile queue lengths. The SimTraffic simulations have a statistical accuracy of plus or minus 5.0 percent error for the AM and PM peak hour simulations.

5.8.6.1 Signalized Intersection Operations Analysis

Based on the Synchro™ and SimTraffic™ analysis, the following signalized intersection approaches would experience failing queue lengths in Synchro™ or SimTraffic™. The lane group within the approach that would be operating under unacceptable conditions is noted in parentheses.

- Loisdale Road/Commerce Street and Franconia Road (Westbound) (Intersection #1)
 - Southbound Commerce Street (right turns) during the PM peak hour
- Loisdale Road/Commerce Street and Franconia Road (Eastbound) (Intersection #2)
 - Eastbound Franconia Street (through and right movements) and northbound Loisdale Road (right turns) during the AM peak hour
 - Northbound Loisdale Road (through movements) during the PM peak hour
- Loisdale Road and Loisdale Court/Mall Access (Intersection #3)
 - Westbound Mall Access (right turns) during the AM peak hour
 - Eastbound Loisdale Court (left and right turns), westbound Mall Access (right turns) and northbound Loisdale Road (left turns) during the PM peak hour
- Loisdale Road and Frontier Drive Extension (Intersection #8)
 - Northbound Loisdale Road (right turns) and southbound Loisdale Road (left turns) during the AM peak hour
 - Westbound Springfield Center Drive (left and right turns) during the PM peak hour
- Loisdale Road and Hotel Entrance/Newington Road (Intersection #1)
 - Westbound Newington Road (right turns) during the PM peak hour
- Loisdale Road/I-95 (N) Ramp C and D and Fairfax County Parkway (Intersection #1)
 - Southbound Fairfax County Parkway (through movements) during the AM peak hour
- Frontier Drive and Franconia Road (Eastbound) (Intersection #1)
 - Eastbound Franconia Road (right turns) and southbound Frontier Drive (combined left and through movement and through only movement) during the AM peak hour
 - Northbound Frontier Drive (through movements) during the PM peak hour
- Frontier Drive and Best Buy/Springfield Mall Parking Lot Entrance (Intersection #1)
 - Westbound Best Buy entrance (left turns) and southbound Frontier Drive (left and through movements) during the AM peak hour
 - Eastbound Spring Mall Parking lot entrance (combined left, through and right movements) and northbound Frontier Drive (all movements) during the PM peak hour
- Frontier Drive and Home Depot/Springfield Mall Garage Entrance (Intersection #1)
 - Westbound Home Depot entrance (all movements) and southbound Frontier Drive (left and through movements) during the AM peak hour
 - Westbound Home Depot entrance (all movements) and northbound Frontier Drive (all movements) during the PM peak hour
- Frontier Drive and Spring Mall Drive (Intersection #1)
 - Eastbound Spring Mall Drive (right turns) and southbound Frontier Drive (through movements) during the AM peak hour
 - Northbound Frontier Drive (all movements) during the PM peak hour
- Frontier Drive and Franconia-Springfield Parkway (Westbound) (Intersection #1)

- Southbound Frontier Drive (through movements) during the AM peak hour
- Westbound Franconia-Springfield Parkway (combined left and through movements and right turns, northbound Frontier Drive (through movements) and southbound Frontier Drive (right turns) during the PM peak hour
- Frontier Drive and Franconia-Springfield Parkway (Eastbound) (Intersection #1)
 - Eastbound F-S Parkway (eastbound off ramp) (all movements) during the AM peak hour
 - Northbound Frontier Drive (right turns) during the PM peak hour
- Franconia-Springfield Parkway and Spring Village Drive/Bonniemill Lane (Intersection #1)
 - Eastbound F-S Parkway (through movements) and northbound Bonniemill Lane (right turns) during the AM peak hour
- Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street (Intersection #1)
 - Westbound Manchester Boulevard (all movements), northbound Beulah Street (left turns and through movements) and southbound Beulah Street (through and right movements) during the AM peak hour
 - Westbound Manchester Boulevard (left and through movements), northbound Beulah Street (left turns and through movements) and southbound Beulah Street (all movements) during the PM peak hour
- Franconia Road and Beulah Street (Intersection #1)
 - Westbound Franconia Road (left turns) during the AM peak hour
 - Westbound Franconia Road (left turns) and eastbound Franconia Road (combined through and right movements) during the PM peak hour
- Frontier Drive Extension and Metro Station (Intersection #1)
 - Northbound Frontier Drive Extension (through movements) during the PM peak hour
- Frontier Drive Extension and Metropolitan Center Drive Extension (Intersection #1)
 - Eastbound Metropolitan Center Drive (left turns and combined left/right turns) during the PM peak hour

5.8.6.2 *Unsignalized Intersection Operations Analysis*

Based on the analysis, the Build Condition queue lengths for the unsignalized intersection approaches would all have acceptable No-build Condition queue lengths.

5.8.6.3 *Complete Intersection Queuing Analysis*

This section summarizes the differences in queuing impacts between the No-build Condition and the Build Condition by quantifying the change in intersection queuing failures. Following the summary, this section also includes the complete results of the queuing analysis.

Based on the Synchro™ and SimTraffic™ analysis, 17 signalized intersections would experience queuing lengths that would exceed the available storage capacity. The remaining intersections in the study area would provide sufficient storage for the anticipated demand. Compared to the No-build Condition, the Build Condition would have three more intersections with failing queues during the AM peak hour and would have eight more intersections with failing queues during the PM peak hour. In the AM peak hour in the No-build Condition, there would be 10 intersections with a failing queue approach compared with 13 in the Build Condition, an increase of 3. In the PM peak hour in the No-build Condition, there would be 7 intersections with a failing queue approach compared with 15 in the Build Condition, an increase of 8.

Table 5-26 provides a summary of the number of intersections that meet the following criteria for approach lane groups in a queue that would change between the No-build and the Build Conditions:

Table 5-26: Queuing Summary Comparing No-build Condition to Build Condition

Type of Change Between Conditions	AM	PM
New Failing Movement	3	8
Additional Failing Movement	4	2
No Change	18	15
Fewer Failing Movements	0	0
No Failing Movements	0	0
Total Signalized and Unsignalized Intersections	25	25

The results of the No-build Condition compared to the Build Condition queuing analysis for both signalized and unsignalized intersections are presented in [table 5-27](#). Note that the percentile values are expressed in feet, and a car occupies about 25 linear feet of roadway, including the space between cars.

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Table 5-27: Comparison of No-build and Build Condition Queuing Analysis

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
1	Loisdale Road/Commerce Street & Franconia Road (Westbound) (Signalized)										
	WB (Franconia Rd)	L	590	121	169	177	232	97	294	174	210
	WB (Franconia Rd)	T	1,100	305	331	261	288	307	392	356	328
	WB (Franconia Rd)	R	605	126	-	39	-	130	82	66	40
	NB (Commerce St)	L	69	2	12	12	42	2	15	20	44
	NB (Commerce St)	T	69	12	21	8	29	11	23	8	33
	SB (Commerce St)	T	722	108	150	273	306	114	564	273	328
	SB (Commerce St)	R	400	2	189	89	365	2	200	89	#410
2	Loisdale Road/Commerce Street & Franconia Road (Eastbound) (Signalized)										
	EB (Franconia Rd)	L	300	110	156	72	127	110	156	72	124
	EB (Franconia Rd)	T	464	158	209	194	224	278	#448	201	240
	EB (Franconia Rd)	R	300	0	71	0	136	0	#518	0	157
	NB (Loisdale Rd)	T	1,093	199	187	313	506	206	546	~393	#1334
	NB (Loisdale Rd)	R	550	0	133	0	158	0	#631	0	144
	SB (Loisdale Rd)	L	69	6	29	0	21	6	57	0	22
	SB (Loisdale Rd)	T	69	6	26	0	40	5	19	0	39
3	Loisdale Road & Loisdale Court/Mall Access (Signalized)										
	EB (Loisdale Court)	L	200	40	63	160	#214	40	68	160	#235
	EB (Loisdale Court)	LT	846	41	95	160	308	41	95	160	489
	EB (Loisdale Court)	R	75	0	61	12	#129	0	53	12	#130
	WB (Mall Access)	L	147	9	30	80	122	9	31	80	130
	WB (Mall Access)	T	147	10	38	23	107	10	42	23	104
	WB (Mall Access)	R	30	0	#64	0	#60	0	#61	0	#62
	NB (Loisdale Rd)	L	225	11	70	19	123	11	81	20	#254
	NB (Loisdale Rd)	T	729	57	84	156	185	56	121	142	581
	NB (Loisdale Rd)	R	400	0	-	0	9	0	-	0	108
	SB (Loisdale Rd)	L	600	6	46	58	129	6	39	58	155
	SB (Loisdale Rd)	T	1,455	56	81	218	1020	78	100	220	956
	SB (Loisdale Rd)	R	140	0	34	4	112	0	27	4	136

Table 5-27: Comparison of No-build and Build Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
4	Loisdale Road & Ramp from NB I-95/Spring Mall Drive (Signalized)										
	EB (Ramp from NB I-95)	L	425	120	167	101	143	115	161	141	161
	EB (Ramp from NB I-95)	T	823	136	173	105	155	174	237	146	154
	EB (Ramp from NB I-95)	R	325	0	53	0	22	0	93	0	31
	WB (Spring Mall Dr)	L	1,295	12	72	91	142	9	48	127	134
	WB (Spring Mall Dr)	R	2,390	85	133	63	171	153	139	121	180
	NB (Loisdale Rd)	TR	527	124	169	147	198	130	172	413	322
	NB (Loisdale Rd)	R	275	0	44	0	71	0	53	29	134
	SB (Loisdale Rd)	L	607	8	48	31	181	7	42	89	227
	SB (Loisdale Rd)	T	729	25	110	54	178	30	110	394	192
5	Loisdale Road & Metropolitan Center Drive (Met Center Dr) (Signalized)										
	WB (Met Center Dr)	L	587	13	28	19	45	13	25	19	48
	WB (Met Center Dr)	R	587	0	52	0	39	0	50	0	41
	NB (Loisdale Rd)	T	598	50	89	38	62	51	91	53	76
	NB (Loisdale Rd)	R	170	0	16	0	15	0	13	0	10
	SB (Loisdale Rd)	L	270	1	48	0	78	1	48	0	81
	SB (Loisdale Rd)	T	527	4	119	0	64	7	137	1	74
6	Loisdale Road & Northern Entrance Road to GSA Facility (Access to Building A, 66808 & 6610 Loisdale Road) (TWSC)										
	WB (N Ent Rd to GSA)	L	-	-	4	-	11	-	-	-	-
	WB (N Ent Rd to GSA)	R	-	-	-	-	-	-	-	-	-
	NB (Loisdale Rd)	TR	-	-	0	-	-	-	-	-	-
	SB (Loisdale Rd)	L	-	-	40	-	-	-	-	-	-
7	Loisdale Road & Southern Entrance Road to GSA Facility (Access to Building B, 7000 Loisdale Road) (TWSC) ^a										
	WB (S Ent Rd to GSA)	L	-	-	27	-	45	-	-	-	-
	WB (S Ent Rd to GSA)	R	-	-	50	-	53	-	-	-	-
	NB (Loisdale Rd)	TR	-	-	8	-	-	-	-	-	-
	SB (Loisdale Rd)	L	-	-	73	-	14	-	-	-	-
	SB (Loisdale Rd)	T	-	-	-	-	39	-	-	-	-
8	Loisdale Road & Frontier Drive Extension (Signalized)										
	WB (Frontier Dr Ext)	L	518	18	48	164	236	23	62	~366	#731
	WB (Frontier Dr Ext)	R	518	0	18	0	43	0	59	0	#762
	NB (Loisdale Rd)	T	2,409	201	261	159	219	196	489	158	253
	NB (Loisdale Rd)	R	100	29	#137	2	90	31	#159	2	98
	SB (Loisdale Rd)	L	700	9	70	10	74	~123	489	16	98
	SB (Loisdale Rd)	T	548	53	99	451	472	52	347	426	472

Table 5-27: Comparison of No-build and Build Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
9	Loisdale Road & Lois Drive (TWSC)										
	WB (Lois Drive Dr)	LR	696	-	51	-	37	-	49	-	35
	NB (Loisdale Rd)	TR	1,594	-	6	-	13	-	14	-	7
	SB (Loisdale Rd)	L	1,000	-	19	-	25	-	21	-	24
	SB (Loisdale Rd)	T	2,409	-	9	-	12	-	9	-	13
10	Loisdale Road & Hotel Entrance/Newington Road (Signalized)										
	EB (Hotel Entrance)	LTR	422	7	50	5	67	7	53	5	71
	WB (Newington Rd)	LT	664	115	236	238	412	115	219	238	424
	WB (Newington Rd)	R	165	0	145	0	#203	0	135	0	#205
	NB (Loisdale Rd)	L	200	2	13	23	63	2	11	23	63
	NB (Loisdale Rd)	T	573	63	112	43	64	71	120	44	60
	NB (Loisdale Rd)	R	365	3	94	0	59	5	94	0	55
	SB (Loisdale Rd)	L	500	29	103	123	180	29	89	123	188
	SB (Loisdale Rd)	T	566	21	53	208	244	21	51	268	334
	SB (Loisdale Rd)	R	450	0	7	0	20	0	4	0	19
11	Loisdale Road/I-95 (N) Ramp C & D & Fairfax County Parkway (Signalized)										
	EB (I-95 Northbound Off-Ramp)	T	409	198	304	51	105	198	315	51	101
	WB (Loisdale Rd)	L	378	93	153	234	241	94	146	256	278
	WB (Loisdale Rd)	R	378	146	164	432	472	146	155	552	#522
	NB (Fairfax County Pkwy)	T	619	453	427	860	626	453	443	860	#619
	NB (Fairfax County Pkwy)	R	300	75	259	21	274	95	260	21	243
	SB (Fairfax County Pkwy)	L	390	256	359	154	239	255	357	154	232
	SB (Fairfax County Pkwy)	T	628	1328	#684	535	400	1328	#645	535	398
	SB (Fairfax County Pkwy)	R	615	0	476	0	-	0	368	0	-
12	Frontier Drive & Franconia Road (Westbound) (Signalized)										
	WB (Franconia Rd)	L	450	102	138	127	171	120	364	128	168
	WB (Franconia Rd)	T	774	406	363	284	233	402	451	283	235
	WB (Franconia Rd)	TR	580	406	499	284	349	402	429	283	285
	NB (Frontier Dr)	L	74	84	52	44	40	84	56	142	58
	NB (Frontier Dr)	T	74	3	17	4	20	3	20	3	17
	SB (Frontier Dr)	T	441	72	115	57	91	71	140	63	95
	SB (Frontier Dr)	TR	240	72	111	57	117	71	156	63	109

Table 5-27: Comparison of No-build and Build Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
13	Frontier Drive & Franconia Road (Eastbound) (Signalized)										
	EB (Franconia Rd)	L	1,067	22	55	62	118	16	47	61	116
	EB (Franconia Rd)	T	1,067	118	173	219	248	105	996	215	239
	EB (Franconia Rd)	R	800	141	-	95	-	522	#1122	106	-
	NB (Frontier Dr)	T	831	336	822	322	556	336	352	~524	#1006
	NB (Frontier Dr)	R	480	0	169	184	169	0	116	126	367
	SB (Frontier Dr)	LT	74	7	28	8	31	7	#90	5	32
	SB (Frontier Dr)	T	74	0	0	0	0	7	#93	5	32
14	Frontier Drive & Best Buy/Springfield Mall Lot Entrance (Springfield Mall Lot Ent) (Signalized)										
	EB (Springfield Mall Lot Ent)	L	199	13	26	143	132	13	32	143	141
	EB (Springfield Mall Lot Ent)	LTR	199	8	58	63	#238	8	95	63	#236
	WB (Best Buy Ent)	L	207	~61	110	104	164	~61	182	104	157
	WB (Best Buy Ent)	TR	207	4	47	14	119	4	42	14	128
	NB (Frontier Dr)	L	190	36	88	135	#212	36	97	139	#301
	NB (Frontier Dr)	T	562	463	220	98	170	464	218	107	#780
	NB (Frontier Dr)	R	500	2	26	0	40	2	31	0	#559
	SB (Frontier Dr)	L	240	53	101	93	182	53	#261	94	186
	SB (Frontier Dr)	T	939	204	113	158	192	361	#1312	161	206
	SB (Frontier Dr)	R	300	0	28	62	63	0	254	61	61
15	Frontier Drive & Home Depot/Springfield Mall Garage Entrance (Springfield Mall Gar Ent) (Signalized)										
	EB (Springfield Mall Gar Ent)	LT	166	2	15	20	56	2	13	20	82
	EB (Springfield Mall Gar Ent)	R	100	0	-	0	18	0	-	0	34
	WB (Home Depot Ent)	LTR	256	~89	182	53	269	~89	#278	53	#341
	NB (Frontier Dr)	L	190	8	26	20	55	8	26	21	#195
	NB (Frontier Dr)	T	469	155	151	69	117	156	165	73	#643
	NB (Frontier Dr)	R	300	1	30	0	25	1	26	0	#410
	SB (Frontier Dr)	L	310	114	163	176	239	114	#414	177	235
	SB (Frontier Dr)	T	562	35	57	83	110	130	#789	87	120
	SB (Frontier Dr)	R	290	0	-	0	-	0	202	0	-

Table 5-27: Comparison of No-build and Build Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
16	Frontier Drive & Spring Mall Drive (Signalized)										
	EB (Spring Mall Dr)	L	215	47	70	81	76	40	79	82	129
	EB (Spring Mall Dr)	LT	2,390	48	114	84	164	41	1837	85	341
	EB (Spring Mall Dr)	R	1,338	0	282	190	488	0	#1373	184	615
	WB (Spring Mall Dr)	LT	218	23	45	148	205	23	79	148	195
	WB (Spring Mall Dr)	R	218	0	35	0	105	0	33	0	129
	NB (Frontier Dr)	L	325	193	198	238	268	179	184	245	#371
	NB (Frontier Dr)	T	717	235	261	311	431	235	244	447	#1003
	NB (Frontier Dr)	R	275	0	42	9	104	0	45	25	#432
	SB (Frontier Dr)	L	200	19	50	29	81	15	176	29	81
	SB (Frontier Dr)	T	469	49	236	147	247	141	#567	151	254
	SB (Frontier Dr)	R	225	0	93	6	198	0	224	7	176
17	Frontier Drive & Franconia-Springfield Parkway (Westbound) (Signalized)										
	WB (F-S Pkwy WB Off-ramp)	L	460	34	66	35	90	54	86	35	106
	WB (F-S Pkwy WB Off-ramp)	LT	792	34	88	34	71	53	121	36	#1080
	WB (F-S Pkwy WB Off-ramp)	R	450	0	33	0	207	0	22	0	#635
	NB (Frontier Dr)	L	262	0	-	1	8	0	4	1	18
	NB (Frontier Dr)	T	262	14	47	22	42	14	48	61	#351
	SB (Frontier Dr)	T	617	269	#738	155	231	~672	#671	239	369
	SB (Frontier Dr)	R	375	59	325	218	318	72	328	411	#423
18	Frontier Drive & Franconia-Springfield Parkway (Eastbound) (Signalized)										
	EB (F-S Pkwy EB Off-ramp)	L	948	168	#1264	196	222	220	#1223	189	794
	EB (F-S Pkwy EB Off-ramp)	LT	948	169	#969	198	194	221	#964	193	825
	EB (F-S Pkwy EB Off-ramp)	R	430	~607	#455	0	96	~1161	#457	0	354
	NB (Frontier Dr)	T	320	17	52	101	139	25	60	289	211
	NB (Frontier Dr)	R	115	0	20	0	#128	0	21	0	#179
	SB (Frontier Dr)	L	262	3	30	15	31	2	23	27	48
	SB (Frontier Dr)	T	262	65	81	4	22	451	59	4	112

Table 5-27: Comparison of No-build and Build Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
19	Franconia-Springfield Parkway & Spring Village Drive/Bonniemill Lane (Signalized)										
	EB (F-S Pkwy)	L	520	74	302	38	77	74	271	38	70
	EB (F-S Pkwy)	T	1,063	~2874	#1320	306	266	~3286	#1396	308	274
	EB (F-S Pkwy)	R	395	0	118	0	10	0	69	0	11
	WB (F-S Pkwy)	L	415	108	150	203	241	108	192	203	272
	WB (F-S Pkwy)	T	2,515	183	143	1097	409	185	165	1231	477
	WB (F-S Pkwy)	R	410	0	39	6	101	0	35	7	158
	NB (Bonniemill Ln)	L	160	37	46	13	33	37	47	13	36
	NB (Bonniemill Ln)	T	160	6	17	3	12	6	14	3	12
	NB (Bonniemill Ln)	R	160	296	#178	0	50	296	#181	0	51
	SB (Spring Village Dr)	L	250	220	248	185	220	220	245	185	231
	SB (Spring Village Dr)	T	830	6	93	9	49	6	105	9	63
	SB (Spring Village Dr)	R	250	0	37	0	129	0	39	0	125
20	Franconia-Springfield Parkway (F-S Pkwy) & I-95 HOT Lane Ramps (Signalized)										
	EB (F-S Pkwy)	L (AM)	640	110	216	-	-	121	207	-	-
	EB (F-S Pkwy)	T	864	330	250	254	325	377	256	256	314
	EB (F-S Pkwy)	R (PM)	-	-	-	0	-	-	-	0	-
	WB (F-S Pkwy)	L (PM)	425	-	-	84	129	-	-	84	129
	WB (F-S Pkwy)	T	1,039	193	233	208	254	203	225	231	259
	WB (F-S Pkwy)	R (AM)	600	0	-	-	-	0	22	-	-
	NB (I-95 HOT Lane Off-ramp)	(AM)	936	67	233	-	-	75	223	-	-
	SB (I-95 HOT Lane Off-ramp)	(PM)	1,071	-	-	0	249	-	-	0	256
	SB (I-95 HOT Lane Off-ramp)	R (PM)	1,071	-	-	0	216	-	-	0	222
21	Franconia-Springfield Parkway (F-S Pkwy)/Manchester Boulevard & Beulah Street (Signalized)										
	EB (F-S Pkwy)	L	610	320	342	261	338	320	328	261	401
	EB (F-S Pkwy)	T	4,336	390	349	912	675	390	327	949	773
	EB (F-S Pkwy)	R	4,336	51	172	470	484	51	172	483	407
	WB (Manchester Blvd)	L	375	91	#430	182	#487	91	#446	182	#475
	WB (Manchester Blvd)	T	813	~695	734	825	#842	~728	#893	828	#782
	WB (Manchester Blvd)	R	575	0	327	0	528	0	#597	0	418
	NB (Beulah St)	L	500	~574	#532	~542	#565	~574	#561	~542	#556
	NB (Beulah St)	T	1,016	358	#1198	294	#1354	358	#1229	294	#1323
	NB (Beulah St)	R	315	0	197	0	189	0	207	0	153
	SB (Beulah St)	L	380	65	134	217	#404	65	196	217	#403
	SB (Beulah St)	T	942	~219	333	~466	#755	~219	610	~466	#789
	SB (Beulah St)	R	235	66	#238	97	#374	66	#306	97	#375

Table 5-27: Comparison of No-build and Build Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
22	Franconia Road & Beulah Street (Signalized)										
	EB (Franconia Rd)	L	190	2	43	3	66	2	29	3	67
	EB (Franconia Rd)	TR	6,354	264	238	~460	391	254	226	~489	407
	WB (Franconia Rd)	L	350	573	#426	~761	#427	570	#422	~761	#425
	WB (Franconia Rd)	TR	965	114	386	197	689	116	292	197	720
	NB (Beulah St)	LT	659	114	167	207	265	114	183	207	255
	NB (Beulah St)	R	659	490	405	257	255	490	401	257	242
	SB (Driveway)	LTR	249	6	28	40	89	6	26	40	122
23	I-95 NB On-ramp & Commerce Street (Signalized)^b										
	EB (Commerce St)	L	515	-	-	1	67	-	-	1	67
	EB (Commerce St)	T	-	-	-	0	-	-	-	0	-
	WB (Commerce St)	T	364	-	-	48	109	-	-	50	107
	WB (Commerce St)	R	364	-	-	0	88	-	-	0	106
24	Frontier Drive Extension (F Dr Ext) & Metro Station (Signalized)										
	WB (Metro Station)	L	401	2	20	46	104	3	19	79	234
	NB (F Dr Ext)	T	217	17	69	60	113	25	59	235	#325
	NB (F Dr Ext)	R	140	51	124	0	19	61	120	0	63
	SB (F Dr Ext) to Driveway	L	300	238	177	86	189	299	161	153	218
	SB (F Dr Ext)	L	300	98	135	40	120	124	119	72	175
	SB (Frontier Dr Ext)	T	-	0	-	0	-	0	-	0	-
25	Frontier Drive Extension & Metropolitan Center Drive Extension (Met Center Dr Ext)^c										
	EB (Met Center Dr Ext)	LR/L	82	-	56	-	#82	9	53	65	#119
	EB (Met Center Dr Ext)	R	82	-	-	-	-	0	30	0	55
	NB (Frontier Dr Ext)	LT	915	-	47	-	17	17	80	16	120
	NB (Frontier Dr Ext)	T	915	-	-	-	8	-	64	-	113
	SB (Frontier Dr Ext)	TR	145	-	12	-	2	14	74	16	120

Table 5-27: Comparison of No-build and Build Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
26	Frontier Drive Extension & Site South Access (TWSC)										
	EB (Frontier Dr Ext)	LT	304	-	-	-	-	66	102	10	63
	WB (Frontier Dr Ext)	TR	962	-	-	-	-	3	20	25	300
	SB (Site South Access)	L	481	-	-	-	-	-	-	-	101
	SB (Site South Access)	R	481	-	-	-	-	0	49	0	296

Notes:

~ 50th percentile volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal. Due to upstream metering, the 95th percentile queue may be less than the 50th percentile queue.

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left / through / right lanes

LTR/LTR = No-Build/Build with Mitigation

TWSC = Two-way STOP-Controlled unsignalized intersection

Red cells denote approaches and lane groups whose queuing length exceeds capacity.

^a Intersection would be removed for the Build Condition.

^b Intersection not analyzed during the AM peak hour.

^c Intersection would operate as a TWSC intersection under the No-build Condition and signalized under the Build Condition.

5.8.7 Overall Traffic Impact Assessment

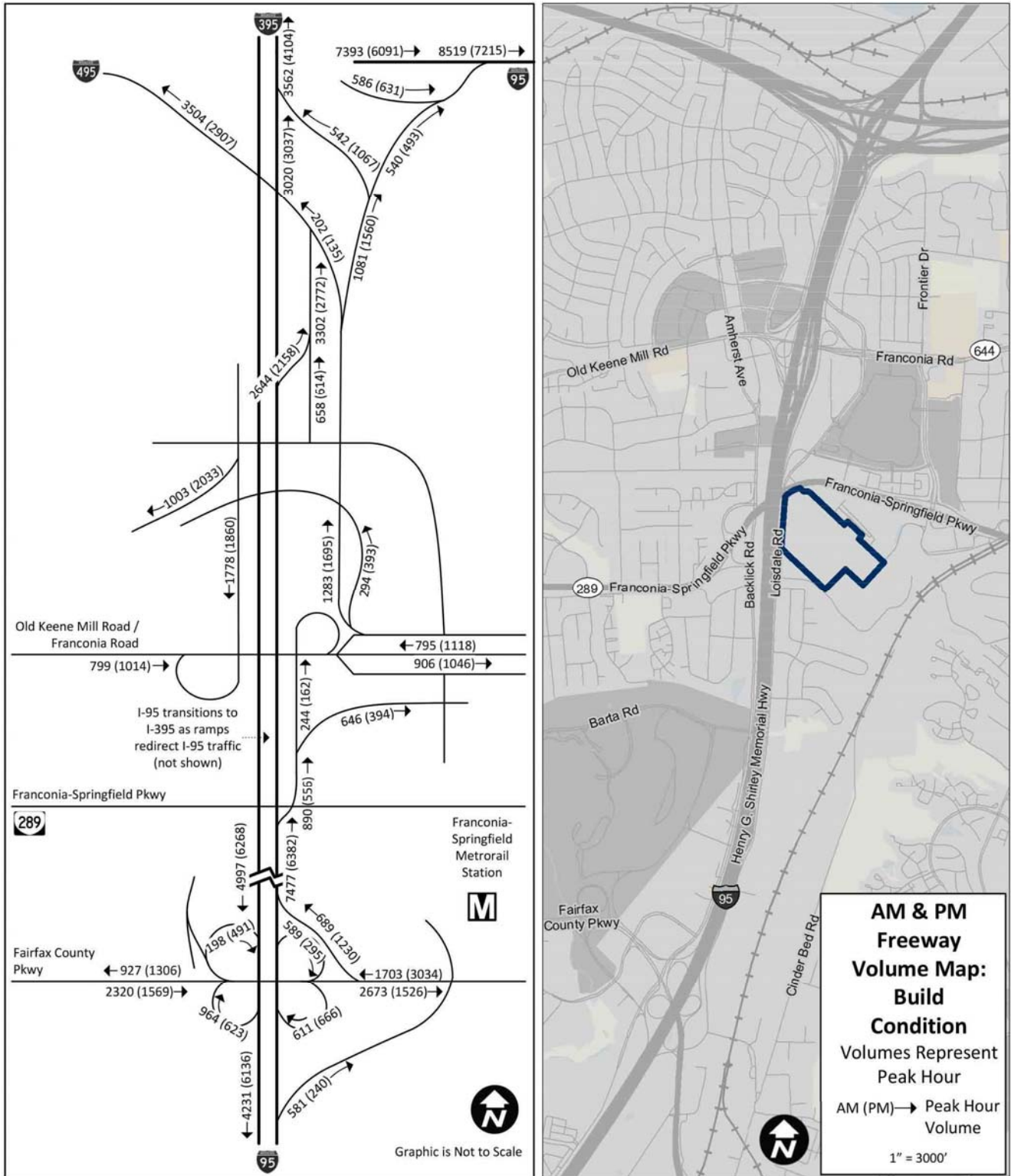
Overall, the AM peak hour would experience corridor-based delays along Frontier Drive in the southbound direction beginning at Franconia-Springfield Parkway Westbound and extending to Franconia Road. A similar condition would occur during the PM peak hour along Frontier Drive beginning at Franconia Road and extending to Franconia-Springfield Parkway Westbound. A second corridor-based delay would occur along Loisdale Road beginning at Franconia Road and extending back to Spring Mall Drive. Together these conditions would result in direct, long-term, major adverse impacts to study area corridors. In addition there would be isolated intersection impacts during the AM peak hour at the Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street intersection and during the PM peak hour at the Loisdale Road and Frontier Drive Extension intersection. Together these would result in direct, long-term, adverse impacts due to the isolated nature of the impacts. There would be no failing Interstate facilities; therefore, there would be no measurable direct, long-term impacts to the Interstate system (see [Section 6.6.7](#) for further information).

Because the intersection of Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street is forecasted to be failing during the No-build Condition, adding construction-related trips along this route caused by trucks, employees, and equipment would have isolated impacts. There would also be additional short-term truck traffic impacts as a result of the demolition of the existing buildings on the GSA-owned parcel requiring dump trucks to haul the debris away on a continual basis until the parcel is clear of existing building materials. These conditions would result in direct, short-term, adverse construction impacts.

5.8.8 Interstate Analysis

Although freeway analysis was not performed for the Build Condition, freeway ramp volumes are included in [figure 5-10](#) to allow a comparison to the Existing Condition, No-build Condition, and Build with Mitigation Condition freeway ramp volumes presented in [Sections 3.7, 4.7, and 6.6](#), respectively. Full analysis of the freeway volumes is included in the Build with Mitigation Condition in [Section 6.6](#).

Figure 5-10: Build Condition Interstate Volumes



5.9 Transportation Demand Management

TDM “is a set of strategies, programs, services, and physical elements that influence travel behavior by mode, frequency, time, route, or trip length in order to help achieve highly efficient and sustainable use of transportation facilities” (DDOT 2010, p.5). TDM measures for the Springfield Build with Mitigation Condition would be developed as part of a Transportation Management Plan accompanying the Final EIS if the Springfield site is chosen as the preferred consolidation location for the FBI HQ. The TDM measures would encourage the reduction of SOV trips by “focusing the demand for transportation services on alternative modes and providing the public with the incentives as well as information to use these alternatives.”

The introduction of TDM measures would serve to ensure the transportation mode splits planned in this study were achieved as well as serve to mitigate travel mode, frequency, time, route, and/or trip length associated with future trips of the consolidated FBI HQ.

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6.0 Mitigation Measures

To reduce impacts on the transportation system caused as a result of the proposed action—consolidation of the FBI headquarters at the Springfield site, mitigation measures are recommended in this section for each mode of transportation analyzed. Also included is a sample of Transportation Demand Management measures to encourage non-SOV travel. Overall, the Springfield site requires moderate mitigation to reduce direct impacts of the proposed action.

6.1 Pedestrians Network

The Franconia-Springfield Metro Station is situated approximately one half-mile northeast from the conceptual location of the headquarters building. Providing the best pedestrian connections between the building and the station would be important to encourage transit use, reduce traffic congestion, improve air quality, and provide an alternative to using a shuttle on a daily basis, especially on days with pedestrian-friendly weather.

It is assumed that the Metropolitan Center Drive extension connecting to the Frontier Drive Extension, as well as the Frontier Drive Extension itself, would have a complete streets design with sidewalks on both sides, clearly marked crosswalks, and possibly one or two well-placed mid-block pedestrian crossings using a special traffic signal called a High Intensity Activated Crosswalk or HAWK signal. HAWK signals temporarily stop vehicular traffic and provide safe passage for a pedestrian through the use of a signal with blinking yellow and red lights. [Figure 6-1](#) shows an example of a HAWK signal in Alexandria, Virginia.

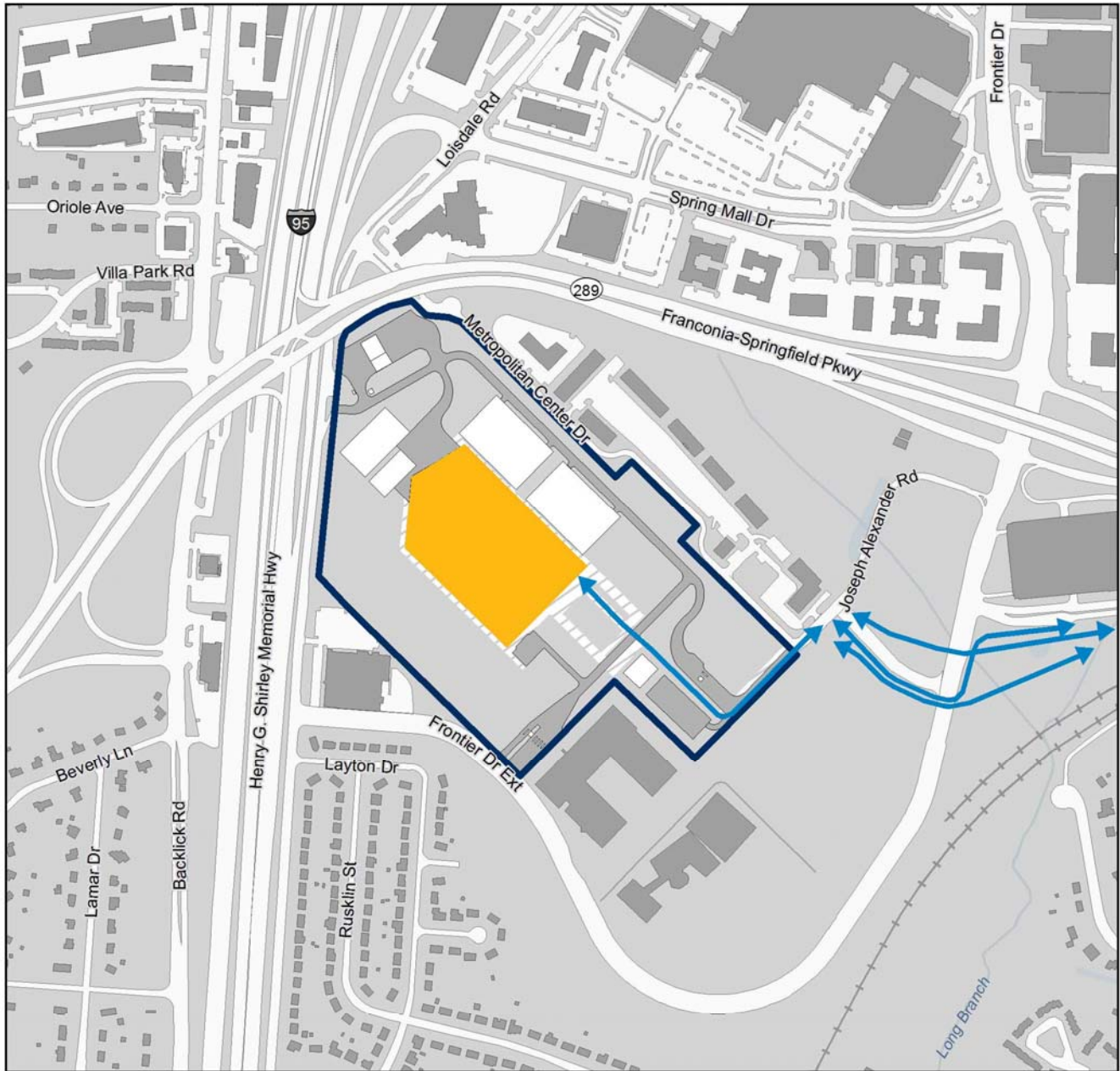
Figure 6-1: HAWK Signal in Alexandria, Virginia



Source: City of Alexandria (2015)

As a result of the increased pedestrian volume between the Metrorail and Springfield site, it is recommended as part of the Build with Mitigation Condition to develop a direct pedestrian connection between the Site East Access and Franconia-Springfield Metro Station. This may include using the planned complete street network along Metropolitan Center Drive Extension and Frontier Drive Extension or cutting the angle to form a direct path from Metropolitan Center Drive to the station and crossing Frontier Drive Extension between the Metro Station Access Road and Metropolitan Center Drive. [Figure 6-2](#) illustrates a few options for connecting the Springfield site to the metro station. Given the future development of Frontier Drive Extension, the change in topography in this location, and the future Metropolitan Center Drive Extension, it is recommended that a study be completed to find the best route for all users of the transportation network.

Figure 6-2: Pedestrian Connection Options between the Springfield Site and Franconia-Springfield Metro Station



Sources:
 ESRI (2013), GSA (2013)
 Fairfax County (2014), Louis Berger (2015)

When compared to the Build Condition, the Build with Mitigation Condition would have no difference in the long-term pedestrian network impacts because the recommended mitigation measures would improve the proposed pedestrian network corridor by adding a new link between the Springfield site and Franconia-Springfield Metro

Station. It is assumed the proposed No-build, Build, and Build with Mitigation Condition pedestrian facilities between the Springfield site and the Metrorail station would be built to accommodate planned development and therefore the increase in pedestrians from the project would not adversely impact the pedestrian network. Therefore, the Build with Mitigation Condition would continue to result in direct, long-term, beneficial impacts that would accrue to not only the FBI employees, but employees and visitors of the Springfield Metro Center II project and the Northern Virginia Community College campus. The Build with Mitigation Condition would continue to include isolated intersection improvements or short-term sidewalk closures causing direct, short-term, adverse construction impacts.

6.2 Bicycles

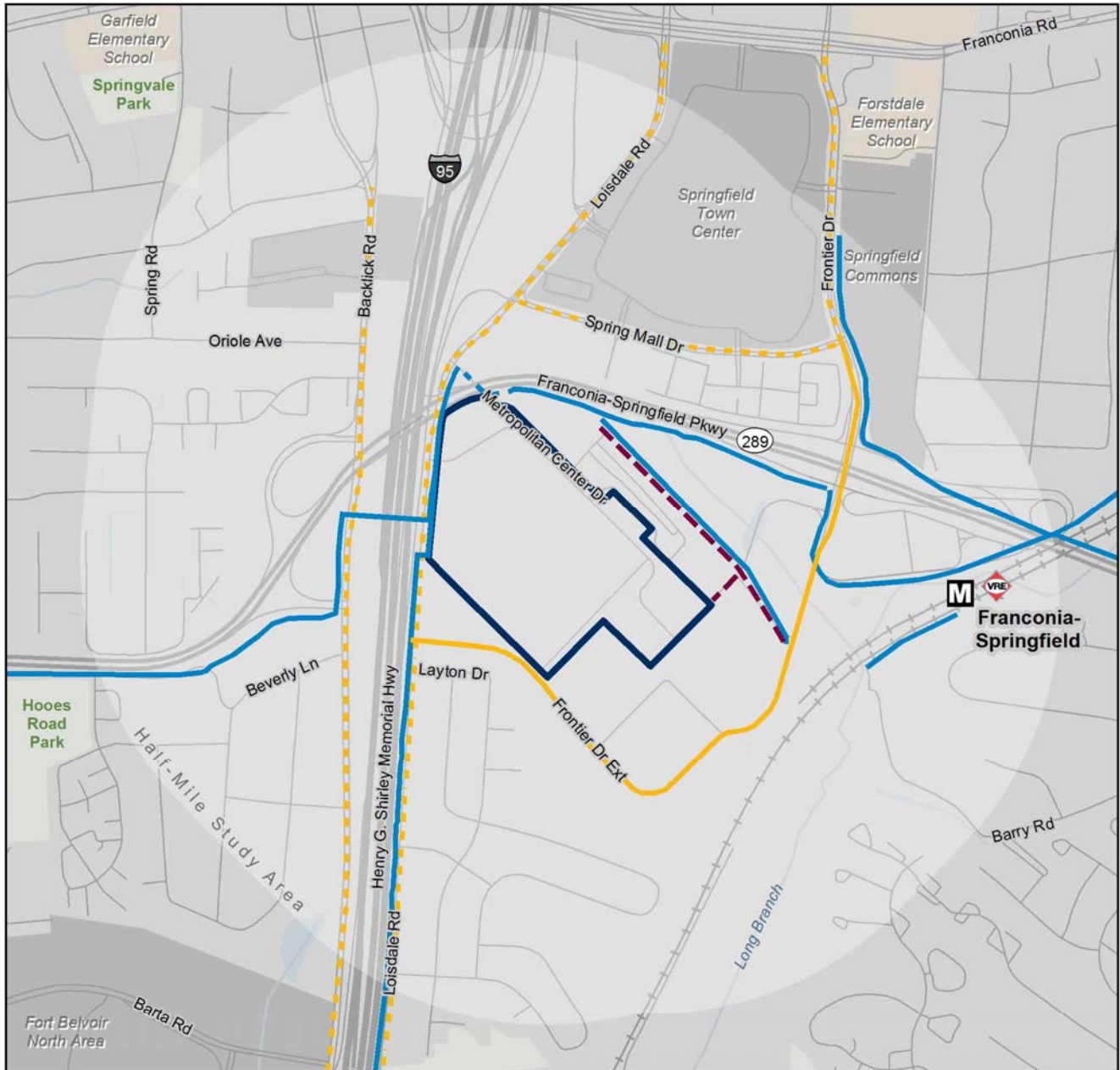
In order to maximize the number of patrons accessing the site via bicycle, the site should be connected to the existing and planned bicycle network. Although the “segment north of and parallel to Metropolitan Center Drive” is shown as an existing off-road trail in the Fairfax County Bicycle Master Plan, this pathway appears to be overgrown based on Google aerial imagery from 2015 (Fairfax County 2014a; Google maps, <https://maps.google.com>). Therefore, one recommendation is to rehabilitate the mixed-use path and create a short bicycle connection along Joe Alexander Road between the Springfield site and the overgrown trail, as summarized in [table 6-1](#) and pictured in [figure 6-3](#). These bicycle improvements would mitigate the increase in bicyclists expected with the proposed action at Springfield and provide multi-modal connectivity north of the site including a direct connection to the Franconia-Springfield Parkway Trail. The path alignment is on an old railroad right of way that GSA owns; therefore, coordination between Fairfax County and GSA would be needed as well as the introduction of a public easement if one does not already exist. As noted earlier, it is anticipated that the bicycle lanes along the Frontier Drive Extension would be built as part of the No-build Condition and are therefore not included in the mitigation.

Table 6-1: Recommended Bicycle Mitigation

Roadway	From/To	Type
Segment north of and parallel to Metropolitan Center Drive	Franconia-Springfield Parkway Trail to Frontier Drive Extension, with connection to Springfield site along Joe Alexander Road	Multi-Use Path

Source: Fairfax County (2014a); Google Maps aerial imagery (<https://maps.google.com>, accessed June 23, 2015)

Figure 6-3: Recommended Bicycle Mitigation



Sources:
 ESRI (2013), GSA (2013), Fairfax County (2014)
 Google Maps (2015), Louis Berger (2014), M-NCPPC (2014)

When compared to the Build Condition, there would be improvements to the bicycle network under the Build with Mitigation Condition resulting in a change from no measureable direct, long-term impacts to direct, long-term, beneficial bicycle network impacts because the recommended mitigation measures would expand the area's bicycle network. Depending on the timing and sequencing of the transportation mitigation improvements with

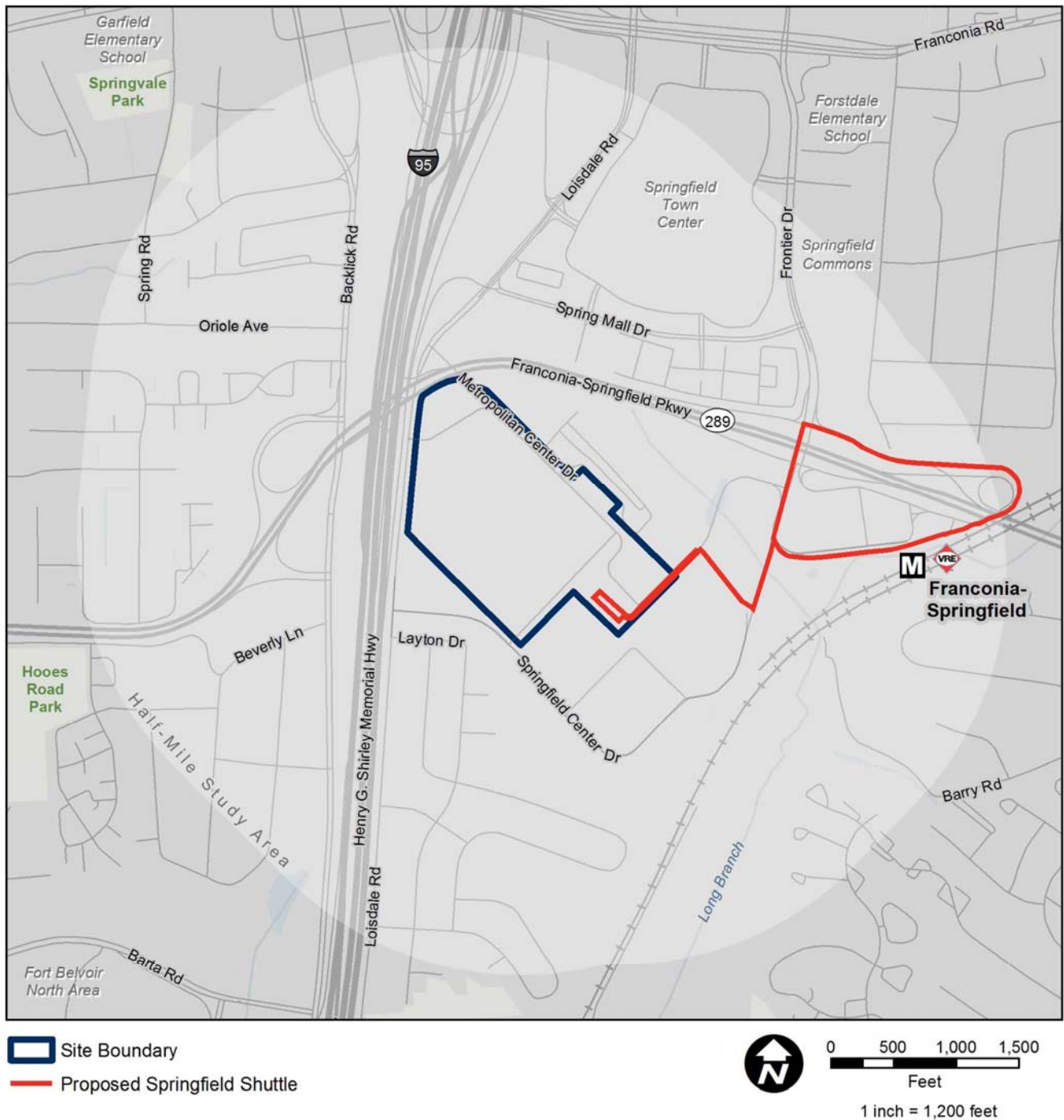
surrounding infrastructure projects, there would continue to be direct, short-term, adverse construction impacts in the Build with Mitigation Condition, particularly on Frontier Drive Extension at the intersection with Metropolitan Center Drive where a roundabout would be introduced, interrupting the No-build Condition bicycle lanes.

6.3 Public Transit

6.3.1 Shuttle to Metrorail

To encourage a higher percentage of employees to use transit to the Springfield site, a shuttle bus service is recommended between Franconia-Springfield Metro Station and the Springfield site as part of the Build with Mitigation Condition to accommodate Springfield site patrons who use transit. The shuttle route would likely use the Franconia-Springfield Metro Station Access Road, the Frontier Drive Extension, Metropolitan Center Drive Extension, and Franconia-Springfield Parkway service roads and ramps north of the parkway as illustrated in [figure 6-4](#).

Figure 6-4: Springfield – Franconia-Springfield Metro Station Anticipated Shuttle Route



Sources:
ESRI (2013), GSA (2013)
Fairfax County (2014), Louis Berger (2015), Google Maps (2015)

6.3.1.1 Ridership and Operating Characteristics

Approximately 4,223 patrons (37.4 percent) are expected to use Metrorail to access the site on a daily basis based on the Springfield Site Transportation Agreement ([Appendix E1](#)), with 1,149 arriving during the AM peak

hour and 1,084 leaving during the PM peak hour. Using Peak Hour Factors (PHF) of 25 percent during the AM peak hour and 29 percent during the PM peak hour, approximately 290 patrons would arrive at Franconia-Springfield Metro Station destined for the Springfield site during the AM peak 15-minute period and approximately 315 patrons would leave the Springfield site destined for Franconia-Springfield Metro Station during the PM peak 15-minute period. Given that the Springfield site is 0.5-mile from Franconia-Springfield Metro Station, certain patrons to the site would likely opt to walk instead of use a shuttle bus. To account for this, potential peak shuttle bus ridership was reduced by 10 percent. [Table 6-2](#) summarizes projected Metrorail ridership to and from the site and potential shuttle bus ridership by time period.

Table 6-2: Springfield Site Patrons Using Shuttle Buses To/From Site

Time Period	Exits (to site)	Entries (from site)	Exits Using Shuttle (to site)	Entries Using Shuttle (from site)
AM Peak Hour	1,149	76	1,034	69
PM Peak Hour	49	1,084	44	976
AM Peak 15-Minute	290	19	261	17
PM Peak 15-Minute	14	315	13	284
Total Weekday	4,223	4,223	3,800	3,800

Sources: Springfield Site Transportation Agreement ([Appendix E1](#)); WMATA (2014b)

During the AM peak 15-minute period, approximately 261 patrons would arrive at Franconia-Springfield Metro Station and need to board shuttle buses. With a capacity of 47 passengers on a typical 40-foot bus (WMATA, 2013c), this would necessitate an AM peak period shuttle bus headway of 2.7 minutes to ensure no overcrowding. During the PM peak 15-minute period, approximately 284 patrons would need to travel from the site to Franconia-Springfield Metro Station on a shuttle bus. This would necessitate a shuttle bus headway of 2.5 minutes to ensure no overcrowding.

Each shuttle bus would travel 1.55 miles per roundtrip between Franconia-Springfield Metro Station and the site, resulting in a runtime of approximately 6.6 minutes, and a cycle time of approximately 10.6 minutes, including two minutes for loading and two minutes for offloading. To maintain a headway of 2.5 minutes with a cycle time of 10.6 minutes, four 40-foot buses would be necessary (cycle time divided by the desired headway). [Appendix E9](#) has further details on the shuttle bus service plan.

6.3.1.2 Operating and Capital Costs

Final operating and capital costs for the proposed shuttle bus service are dependent on the final contract negotiated between the GSA and the contracted agency or entity (private or public). However, using an operating cost of \$122 per hour (WMATA's 2009 system operating cost inflated to 2022 levels per the Bureau of Labor Statistics (BLS) Consumer Price Index) with 250 days of service per year, the annual operating cost of the shuttle bus would be approximately \$782,427 (WMATA 2009; BLS 2015). Additionally, four 40-foot buses would cost approximately \$2.24 million in 2022 dollars (APTA 2013; BLS 2015). [Table 6-3](#) summarizes the operating and capital costs of the Springfield shuttle and how these values were determined.

Table 6-3: Springfield Site Shuttle Bus Operating and Capital Costs

#	Assumption	Value	Note/Source/Formula
1	Peak Headway	2.5 minutes	Using PM peak period
2	Cycle Time	10.6 minutes	6.6 minute runtime, 4 minute load/unload time
3	Roundtrip Length	1.55 miles	-
4	Daily Roundtrips	145	45 AM peak trips, 24 midday trips, 73 PM peak trips, 4 evening trips
5	Daily Miles	224.8	= #3 X #4
6	Daily Hours	25.7	= #2 X #4 / 60
7	Annual Days	250	= 356 – 104 (weekend days) – 2 (holidays)
8	Annual Miles	56,188	= #5 X #7
9	Annual Hours	6,430	= #6 X #7
10	Cost per Hour	\$122	WMATA, 2009; BLS, 2015 (rounded)
11	Annual Operating Cost	\$782,427	= #9 X #10 (rounded)
12	Capital Cost Per Vehicle (40')	\$560,973	APTA, 2013; BLS, 2015
13	Vehicles Needed	4	= #2 / #1 (rounded)
14	Vehicle Purchase Cost	\$2,243,893	= #12 X #13

Note: Calculations may not appear correct due to rounding.
 Source: WMATA (2009); APTA (2013); BLS (2015)

6.3.1.3 Bus Bay Needs

Currently, the Franconia-Springfield Metro Station bus loop has a total of eight bus bays, all of which are occupied by WMATA, Fairfax Connector, or PRTC routes (WMATA 2015b). Additionally, three new bus bays are planned for construction in 2016, bringing the total number of bus bays at the station to 11. WMATA standards call for a maximum of six buses per hour per bay (WMATA 2008b). The maximum acceptable capacity (based on a two minute loading/unloading time and a three minute layover time), however, is 12 buses per hour (WMATA 2013b). Currently, the station has 70 buses per hour, which is higher than WMATA’s standard capacity of 66 buses per hour with 11 bays, but less than the maximum acceptable capacity of 132 buses per hour with 11 bays. The Springfield site shuttle would require buses every 2.5 minutes, or 24 buses per hour, and therefore require the use of a minimum of two bays. Overall, the 2022 Springfield Build with Mitigation Condition would have a total of 94 buses per hour, less than the maximum acceptable capacity at the station but nearing capacity based on WMATA standards. No additional bus bays would have to be constructed to accommodate the shuttle buses given a maximum acceptable capacity of 12 buses per hour per bay provided local and regional bus service does not substantively increase requiring additional bus bays, as assumed in this analysis. [Table 6-4](#) summarizes the Franconia-Springfield Metro Station bus loop capacity analysis for the Springfield Build with Mitigation Condition with employee shuttles.

Table 6-4: Franconia-Springfield Metro Station Bus Loop Capacity Analysis

Year/Condition	Buses Per Hour	Bus Bays	Standard Capacity (Six Buses Per Hour Per Bay)	Maximum Acceptable Capacity (Twelve Buses Per Hour Per Bay)
2014 Existing	70	8	48	96
2022 No-build	70	11	66	132
2022 Springfield Build/Build with Mitigation	94	11	66	132

Sources: WMATA (2008b); WMATA (2013b); WMATA (2015b); WMATA (2015e)

6.3.2 Recommended Transit Mitigation

The following recommendations in [table 6-5](#) are made to mitigate the proposed transit impacts of the Springfield Build Condition:

Table 6-5: Recommended Transit Mitigation

Impact	Mitigation
<p>To maximize the number of site patrons utilizing Metrorail, a shuttle bus would be implemented between the Springfield site and Franconia-Springfield Metro Station due to the over 0.5-mile walk between the station and the site.</p> <p>The shuttle bus service would contribute additional peak hour trips to the local roadway network and would require the use of two bus bays at the station, which could be accommodated once WMATA constructs three new planned bus bays at the station.</p>	<p>Implement shuttle bus service between Franconia-Springfield Metro Station and the Springfield site.</p>

The shuttle bus volumes were added to the mitigated roadway system to determine if the additional volume would impact the recommended roadway mitigation measures. A 2.5 minute shuttle headway or 24 buses per peak hour would equate to 36 passenger vehicle trips, assuming that each bus was the equivalent length of 1.5 passenger vehicles. This passenger car equivalent value was added to both the AM and PM peak hour mitigated roadway network to determine the operations and queuing. Based on the Synchro™ and SimTraffic™ results, no additional mitigation measures would be necessary to accommodate the 36 additional trips added to the peak hour networks. [Appendix E10](#) includes the traffic analysis results for those intersections impacted by the additional anticipated shuttle bus route trips. It should be noted that the shuttle route is based on the conceptual Springfield site plan, the latest VDOT plan to extend Frontier Drive, and the revised Franconia-Springfield Metro Station circulation network. A more definitive shuttle bus route would be determined through the TMP.

When compared to the Build Condition, there would be no difference in long-term public transit capacity impacts under the Build with Mitigation Condition because transit service would remain under capacity. Therefore, there would continue to be no measurable direct, long-term impacts to public transit capacity. The recommended traffic mitigations along Loisdale Road and the Frontier Drive Extension, however, would reduce traffic delays for all vehicles to conditions better than the No-build Condition. Because buses along this route would also experience reduced delays including Fairfax Connector Route 334, there would be overall beneficial impacts to bus service compared to the baseline No-build Condition. The implementation of the shuttle between the Franconia-Springfield Metro Station and the Springfield site would cause direct beneficial impacts for the FBI employees. Based on limiting the shuttle service to the use of FBI employees, there would be no impact to the overall public

transit system. The actual shuttle service could operate along a different route and/or could be integrated into an existing or new route provided by a public or private provider.

During construction, when compared to the Build Condition, the level of impacts would deteriorate from direct, short-term, adverse to direct, short-term, major adverse construction impacts caused by construction vehicles blocking the one or more lanes near the project site and intermittent lane closures at a number of isolated intersections affecting all buses servicing the study area.

6.4 Parking

As mentioned in the Build Condition section, parking impacts would largely be addressed through development and implementation of a Transportation Management Plan (TMP), which would include preferred strategies for discouraging employees from parking on local streets. Because the TMP would be implemented as part of the Build Condition, there would be minimal changes in parking impacts between the Build and Build with Mitigation Conditions. The introduction of a roundabout as mitigation at the intersection of Frontier Drive Extension and Metropolitan Center Drive would, however, remove several on-street parking spaces (see proposed mitigation locations in Section 7.2.11.8),

Due to the small reduction in public on-street parking spaces, when compared to the Build Condition, there would be a change in long-term parking impacts from no measurable direct, long-term impacts to direct, long-term, adverse impacts to parking. Compared to the Build Condition, there would be a change in short-term construction parking impacts from no measurable direct, short-term impacts to direct, short-term, adverse impacts under the Build with Mitigation Condition as a result of construction of the roundabout on Frontier Drive Extension that would impact on-street parking.

6.5 Truck Access

No mitigation is recommended for truck access as part of the Build with Mitigation Condition. Note that the Build Condition includes proper signing and communication of truck access restrictions to alleviate impacts to truck access.

When compared to the Build Condition, there would be no difference in the long-term or short-term truck access impacts under the Build with Mitigation Condition, because the recommended mitigation measures would not change the truck access conditions. Under the Build with Mitigation Condition, there would be no measurable direct, long-term or short-term impacts to truck access during operation of the facility or during construction, respectively.

6.6 Traffic Analysis

6.6.1 Development of Mitigated Network

Based on the Build Condition traffic operations and queueing analysis, a number of intersections would fail (defined in the existing condition section) and require mitigation. Rather than mitigate the failing intersections based on the Build Condition DTA traffic assignment, a second DTA was run to reflect the change in travel patterns due to the following proposed major mitigation strategies:

- Adding a new 430-foot right-turn lane at the Franconia-Springfield Parkway off-ramp to Frontier Drive
- Upgrading the intersection of Loisdale Road and Frontier Drive Extension to include a second left-turn lane for the southbound approach and a second lane departing the intersection south on Loisdale Road to allow a double left from Frontier Drive Extension

- Updating the traffic signal timing along Loisdale Road between Franconia Road and Frontier Drive Extension based on all forecasted FBI vehicle trips traveling between Franconia Road and the Springfield site using Loisdale Road
- Updating the traffic signal timings along Frontier Drive between Franconia Road and Franconia-Springfield Parkway based on all forecasted FBI vehicle trips traveling between Franconia Road and the Springfield site using Frontier Drive

Synchro™ was used to preliminarily design the lane geometry and traffic signal timings for the Loisdale Road and Frontier Drive intersections between Franconia Road and the Springfield site based on the forecasted FBI vehicle volume through these corridors. The TransModeler™ modeled network was then updated with the Synchro™ lane geometry and traffic signal timings to create a modeled network that offers the FBI vehicle trips the best travel time among several options to travel between the modeled network edge and Springfield site. The TransModeler™ DTA was run for 30 simulation runs. At the conclusion of the simulation runs, the software recorded the version with the best vehicle travel times. Since there were a number of possible alternative routes available, the DTA result provided alternative routing to or from all destinations except Franconia-Springfield Parkway and Fairfax County Parkway. Table 6-6 contains the DTA vehicle assignment. Figure 6-5 shows the Build with Mitigation Condition trip generation representing the removal of existing GSA trips and addition of consolidated HQ FBI trips. Figure 6-6 contains the Build with Mitigation Condition turning movement volumes.

Table 6-6: DTA Vehicle Assignments

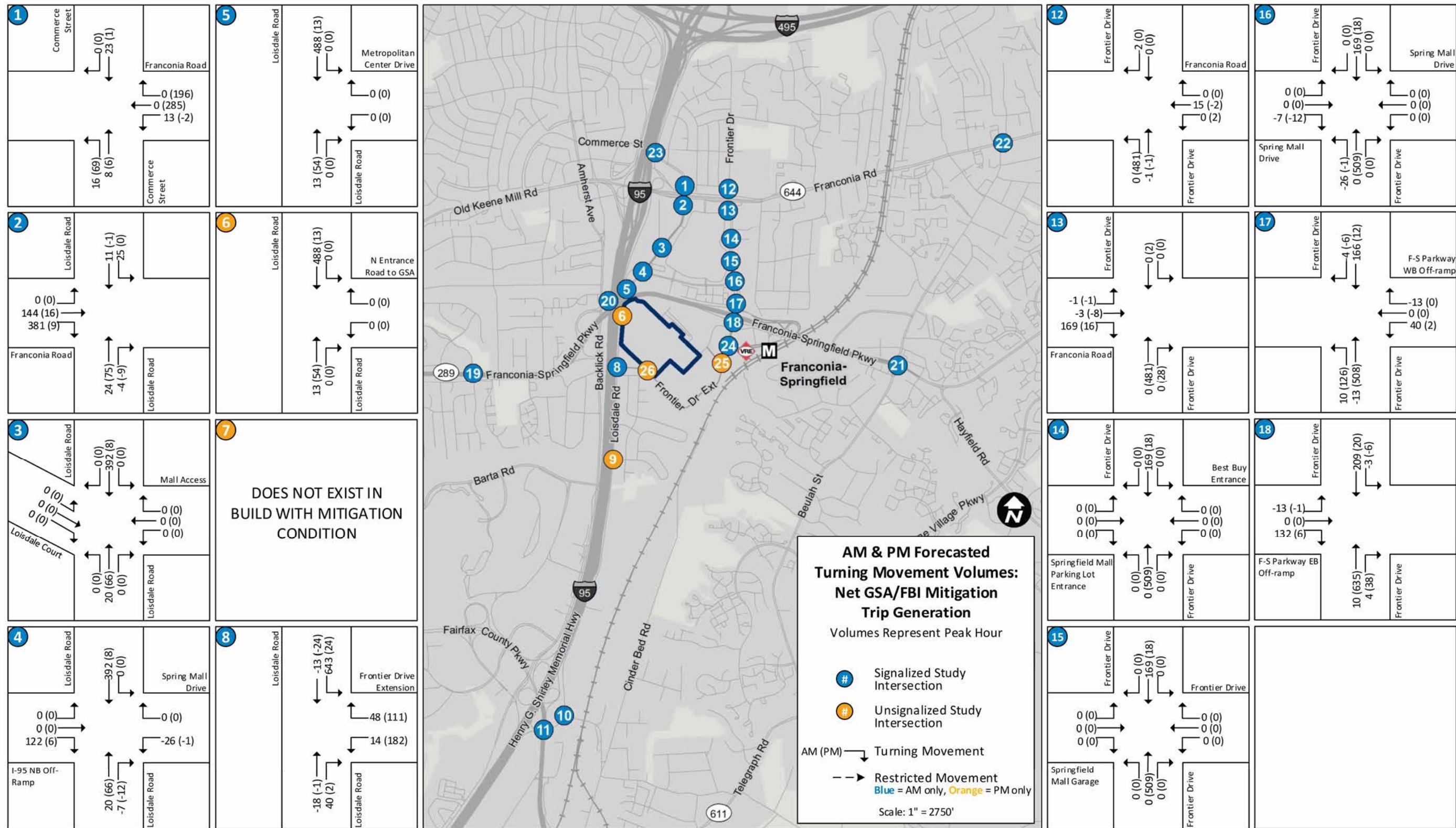
Route Origin	Primary Route to Site	AM Peak Hour		PM Peak Hour	
		Inbound	Outbound	Inbound	Outbound
I-95/I-495 North	Loisdale Road	47%	100%	43%	42%
	Frontier Drive	53%	0%	57%	58%
I-95 South	Loisdale Road	53%	0%	100%	0%
	Spring Mall Drive/Frontier Drive	47%	0%	0%	0%
	Loisdale Road/FCP	0%	100%	0%	100%
I-495 North	Loisdale Road	47%	100%	43%	28%
	Frontier Drive	53%	0%	57%	72%
I-395 North	Loisdale Road	47%	100%	43%	40%
	Frontier Drive	53%	0%	57%	60%
Backlick Road	Loisdale Road	9%	100%	100%	23%
	Frontier Drive	91%	0%	0%	77%
Old Keene Mill Road	Loisdale Road	60%	100%	100%	45%
	Frontier Drive	40%	0%	0%	55%
Franconia Road	Loisdale Road	0%	0%	0%	21%
	Frontier Drive	100%	100%	100%	79%
FSP West	Frontier Drive	100%	100%	100%	100%
FSP East	Frontier Drive	100%	100%	100%	100%
FCP North	Loisdale Road	100%	100%	100%	100%
FCP South	Loisdale Road	100%	100%	100%	100%

Notes:

FSP = Franconia Springfield Parkway

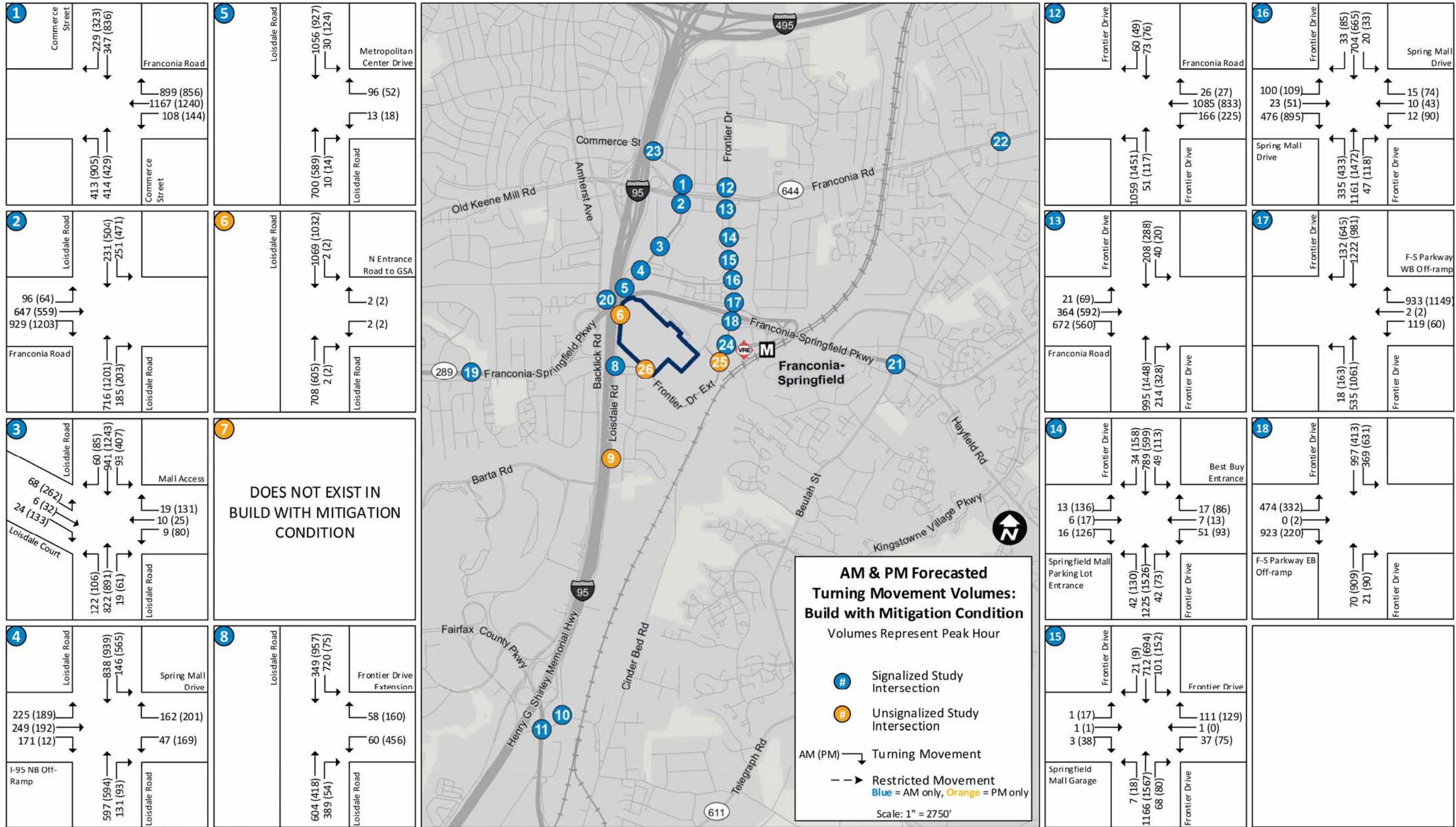
FCP = Fairfax County Parkway

Figure 6-5: Build with Mitigation Condition Trip Generation



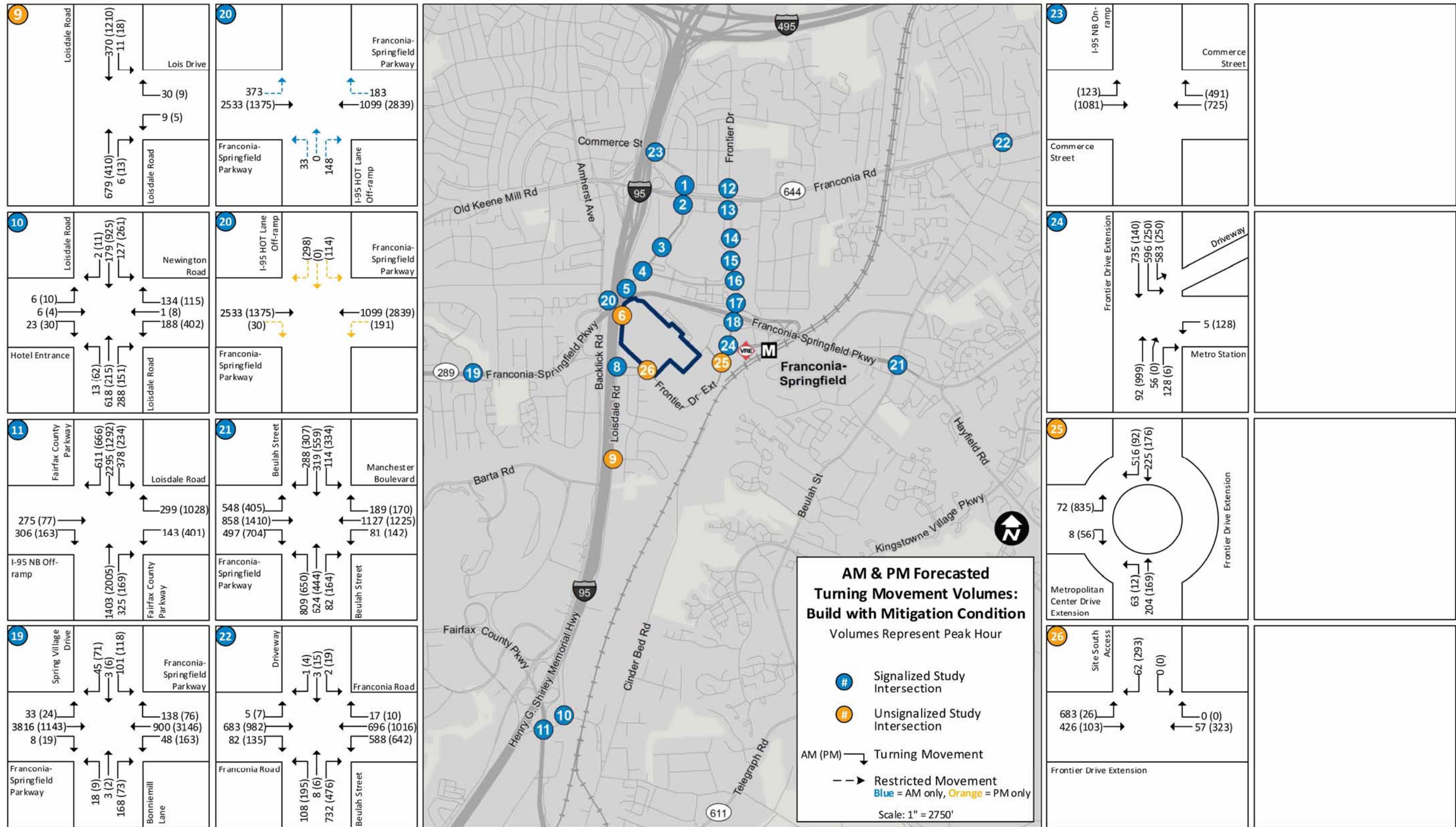
Note: Intersection #23 is analyzed only during the PM peak hour.

Figure 6-6: Build with Mitigation Condition Turning Movement Volumes



Note: Intersection #23 is analyzed only during the PM peak hour.

Figure 6-6: Build with Mitigation Condition Turning Movement Volumes (continued)



Note: Intersection #23 is analyzed only during the PM peak hour.

6.6.2 Recommend Mitigation Measures

Once the DTA was completed, the resulting traffic volumes were entered into Synchro™ to determine the study area intersection operations and queuing. Each intersection that had LOS degradation from a passing LOS (A-D) to a failing LOS (E or F) by lane group (right turns, through movements, or left turns) when compared to the No-build Condition was mitigated by one of the following methods:

- Optimizing the existing traffic signal (change the amount of seconds of green to each approach)
- Coordinating a corridor of traffic signals
- Revising the existing lane geometry (number of right versus through versus left-turning lanes)
- Adding new turning lanes
- Adding through lanes

A list of mitigation measures was developed through an iterative process of testing the different improvement strategies, starting with optimizing the traffic signals and progressing to adding lanes if warranted. The recommended roadway improvements include external roadway mitigation measures that supports the revised Springfield conceptual site plan. If implemented, the external roadway mitigations would improve the traffic operations at all study area intersections to a passing LOS (HCM-based) or if failing would be equal to or better than the No-build Condition operations. The recommended mitigations would also result in no vehicle queues beyond the available storage capacity, or if beyond the storage capacity, would be no greater than 150 feet longer than the queues measured for the No-build Condition. An acceptable queue length increase is not cited in the VDOT Traffic Impact Analysis Regulations (VDOT 2012b); therefore, the 150 feet is referenced from the District Department of Transportation Comprehensive Transportation Review Requirements (DDOT 2012) guidance and provides a reasonable increase (approximately six vehicles or less).

Table 6-7 contains the list of mitigation measures. Figure 6-7 shows the locations of the mitigation measures. Figure 6-8 shows the lane geometry with the mitigation in place and figure 6-9 shows the AM peak hour inbound and PM peak hour outbound FBI vehicle trip paths.

Table 6-7: Recommended Mitigation Measures

Map ID	Mitigation	Strip Land Taking (Approximate Linear Feet)
A	Franconia Road (VA 644) Westbound and Commerce Street	
	<ul style="list-style-type: none"> Optimize the traffic signal and coordinate timings with nearby key intersections for AM and PM peak periods 	None
B	Franconia Road (VA 644) Eastbound and Loisdale Drive	
	<ul style="list-style-type: none"> For the Loisdale Road northbound approach, revise the planned roadway improvement design to lengthen the left-turn lane by 225 feet resulting in a 775-foot turn bay and revise the lane geometry to allow the Loisdale Road northbound left lane to directly feed into the middle left-turn lane at the intersection, the Loisdale Road northbound middle lane directly feed into the right most left-turn lane at the intersection, and Loisdale Road northbound right lane directly feed into the left most through lane at the intersection. For the Franconia Road eastbound approach, revise the planned roadway improvement design to extend the right-turn lane by 50 feet resulting in a 350-foot right-turn lane. Optimize the traffic signal and coordinate timings with nearby key intersections for AM and PM peak periods. 	None
C	Loisdale Road and Loisdale Court	
	<ul style="list-style-type: none"> Optimize the traffic signal for the AM peak period and coordinate timings with nearby key intersections for AM and PM peak periods. 	None
D	Loisdale Road and I-95 Northbound off-ramp/Spring Mall Drive	
	<ul style="list-style-type: none"> For the Spring Mall Drive westbound, revise the planned roadway improvement design by changing the channelized right-turn lane to provide a free merge onto Loisdale Road northbound by reducing the number of departing lanes from three to two on Loisdale Road northbound, thus allowing the channelized right-turn to feed into the planned new third lane. Optimize the traffic signal and coordinate timings with nearby key intersections for AM and PM peak periods. 	None
E	Loisdale Road and Metropolitan Center Drive	
	<ul style="list-style-type: none"> Optimize the traffic signal for AM and PM peak periods and coordinate timings with nearby key intersections for the PM peak period. 	None

Table 6-7: Recommended Mitigation Measures (continued)

Map ID	Mitigation	Strip Land Taking (Approximate Linear Feet)
F	Loisdale Road and Frontier Drive Extension	
	<ul style="list-style-type: none"> For the Loisdale Road northbound approach, revise the planned roadway improvement design to include a 300-foot right-turn lane (<i>strip land taking required; approximately 400 linear feet</i>). For the Loisdale Road southbound approach, revise the planned roadway improvement design to include two 350-foot left turn lanes (<i>strip land taking required; approximately 400 linear feet</i>). Optimize the traffic signal for AM and PM peak periods. 	800
G	Loisdale Road and Newington Road	
	<ul style="list-style-type: none"> For the Newington Road westbound approach, extend the right-turn lane by 85 feet creating a 250-foot turning lane. 	None
H	Loisdale Road and Fairfax County Parkway (VA 286)	
	<ul style="list-style-type: none"> For the Fairfax County Parkway northbound approach, revise the planned roadway improvement design to lengthen the right-turn lane and new through lane by 50 feet resulting in one 350-foot through lane and one 350-foot right-turn lane. For the Fairfax County Parkway southbound approach, revise the planned roadway improvement design to lengthen the left-turn lanes by 60 feet resulting in two 450-foot left-turn lanes. For the Loisdale Road westbound approach, revise the planned roadway improvement design to lengthen the existing right-turn lane by 60 feet resulting in a 425-foot right-turn lane (<i>strip land taking required; approximately 60 linear feet</i>). Optimize the traffic signal for AM and PM peak periods and coordinate timings with nearby key intersections for the PM peak period. 	60
I	Franconia Road (VA 644) Westbound and Frontier Drive	
	<ul style="list-style-type: none"> Optimize the traffic signal for AM and PM peak periods and coordinate timings with nearby key intersections for the PM peak period. Construct a network of pedestrian bridges to provide a safe path for pedestrians to cross Frontier Drive and Franconia Road for both the eastbound and westbound directions. 	None

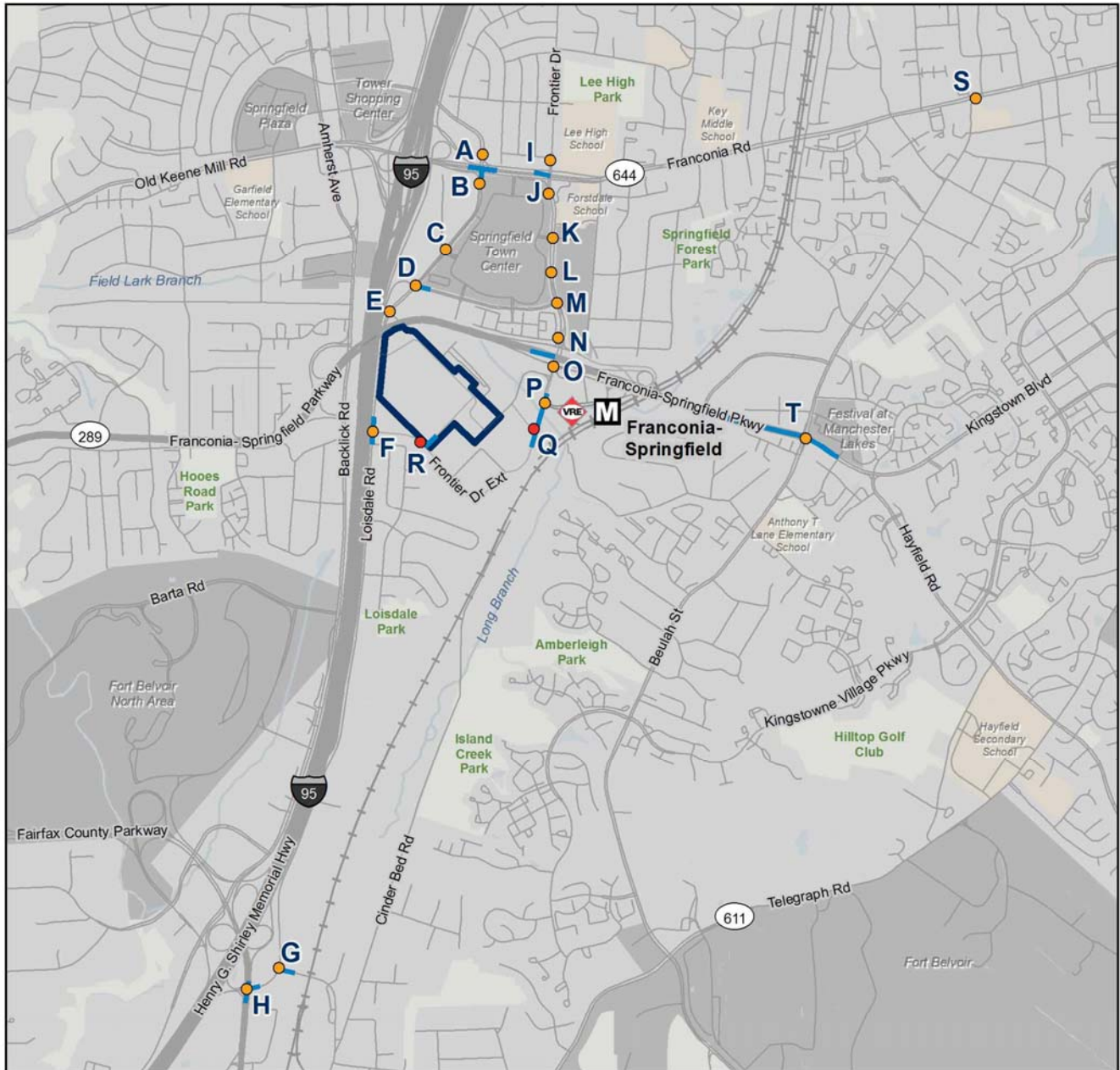
Table 6-7: Recommended Mitigation Measures (continued)

Map ID	Mitigation	Strip Land Taking (Approximate Linear Feet)
J	Franconia Road (VA 644) Eastbound and Frontier Drive	
	<ul style="list-style-type: none"> For the Frontier Drive northbound approach, extend the left-turn lane by 95 feet resulting in a 600-foot left-turn lane. Optimize the traffic signal for AM and PM peak periods and coordinate timings with nearby key intersections for the PM peak period. Construct a network of pedestrian bridges to provide a safe path for pedestrians to cross Frontier Drive and Franconia Road for both the eastbound and westbound directions. 	None
K	Frontier Drive and North Mall Entrance	
	<ul style="list-style-type: none"> Optimize the traffic signal for the PM peak period and coordinate timings with nearby key intersections for the AM peak period. 	None
L	Frontier Drive and Mall South Entrance	
	<ul style="list-style-type: none"> Optimize the traffic signal for the PM peak period and coordinate timings with nearby key intersections for the AM peak period. 	None
M	Frontier Drive and Spring Mall Drive	
	<ul style="list-style-type: none"> Optimize the traffic signal and coordinate timings with nearby key intersections for the AM peak period. 	None
N	Frontier Drive and Franconia-Springfield Parkway (VA 289) westbound on/off ramps	
	<ul style="list-style-type: none"> Optimize the traffic signal for AM and PM peak periods and coordination timings with nearby key intersections for the PM peak period. 	None
O	Frontier Drive and Franconia-Springfield Parkway (VA 289) eastbound on/off ramps	
	<ul style="list-style-type: none"> For the Franconia-Springfield Parkway eastbound approach, create a new 430-foot left-turn lane, create a new 440-foot right-turn lane, and alter the off-ramp to feed into each turn lane. The resulting lane geometry would be two left-turn lanes and two right-turn lanes. Optimize the traffic signal for AM and PM peak periods and coordinate timings with nearby key intersections for the PM peak period. 	None

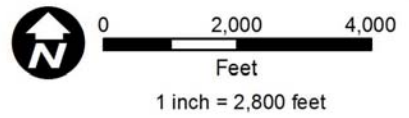
Table 6-7: Recommended Mitigation Measures (continued)

Map ID	Mitigation	Strip Land Taking (Approximate Linear Feet)
P	Frontier Drive Extension and Metro Station Access Drive	
	<ul style="list-style-type: none"> For the northbound Frontier Drive Extension, revise the planned roadway improvement design to extend the right-turn lane by 60 feet resulting in a 200-foot right-turn lane. Optimize the traffic signal for the PM peak period. 	None
Q	Frontier Drive Extension and Metropolitan Center Drive Extension	
	<ul style="list-style-type: none"> Revise the planned roadway improvement design to create a two-lane roundabout with two lane exits for Frontier Drive Extension northbound and southbound and a one lane exit for Metropolitan Center Drive Extension. Create two-lane entries for all three approaches. For the Frontier Drive Extension southbound approach, create a 175-foot right-turn lane that feeds into a 275-foot right-turn bypass lane and rejoins Metropolitan Center Drive Extension after the intersection serving the Springfield Metro Center Phase II development (approximately 150 feet west of the roundabout). 	None
R	Frontier Drive Extension and Site South Access	
	<ul style="list-style-type: none"> For the Frontier Drive Extension eastbound approach, revise the planned roadway improvement design to create a 275-foot left turn lane. For the Site South Access southbound approach, create a channelized right-turn lane that yields onto westbound Frontier Drive Extension and a one-lane approach serving left-turning vehicles. The northbound Site South Access departing lanes would need to accommodate the ECF approximately 165 feet north of the intersection requiring five lanes. 	None
S	Franconia Road (VA 644) and Beulah Street	
	<ul style="list-style-type: none"> Optimize the traffic signal for the PM peak period. 	None
T	Franconia-Springfield Parkway (VA 289) and Beulah Street	
	<ul style="list-style-type: none"> For the Franconia-Springfield Parkway eastbound approach, change the lane geometry to provide one left-turn lane, three through lanes, and one right-turn lane by assigning the existing right-turn lane as a through lane and creating a new 200-foot right-turn lane. Extend the new through lane into the existing right-turn lane past the intersection and create a new 1,150-foot fourth lane past the intersection to receive the channelized right from the Beulah Street southbound approach. Extend the fourth lane to Walking Lane. 	None

Figure 6-7: Build with Mitigation Condition Improvement Locations



- Site Boundary
- Roadway Improvement
- Intersection Improvement (Signalized)
- Intersection Improvement (Unsignalized)



Sources:
 ESRI (2013), GSA (2013)
 Fairfax County (2014)

Figure 6-8: Build with Mitigation Condition Lane Geometry

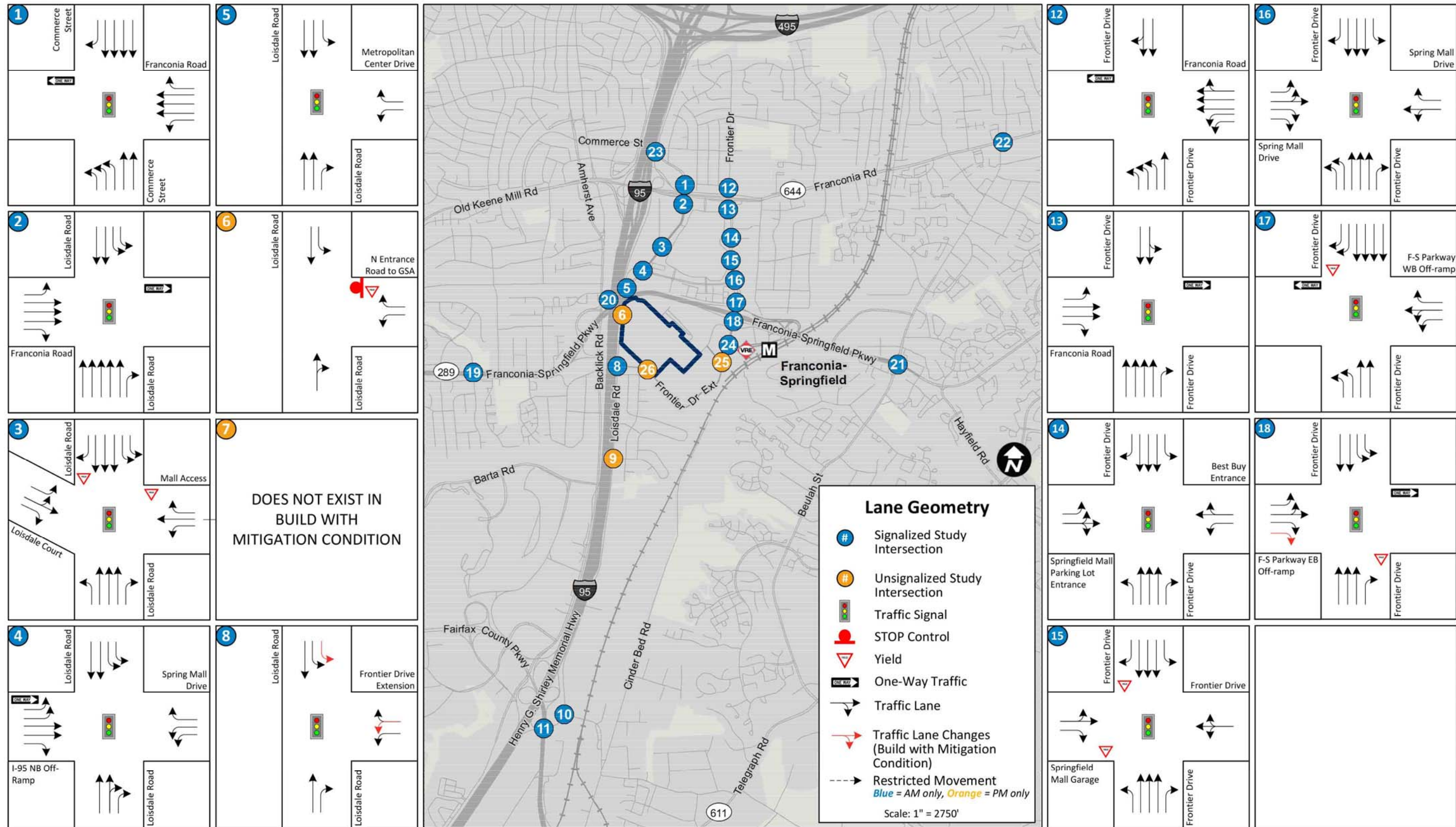
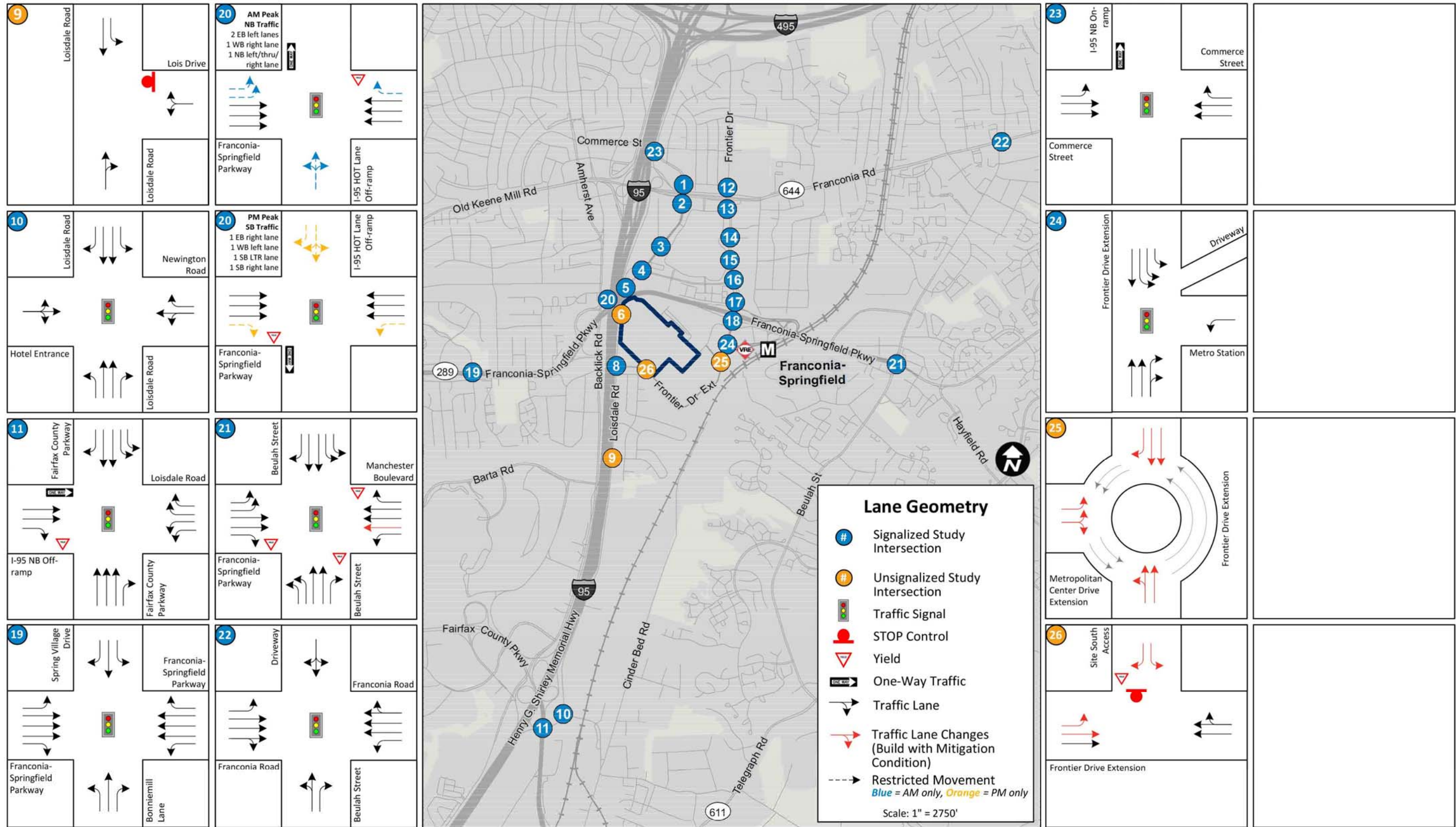
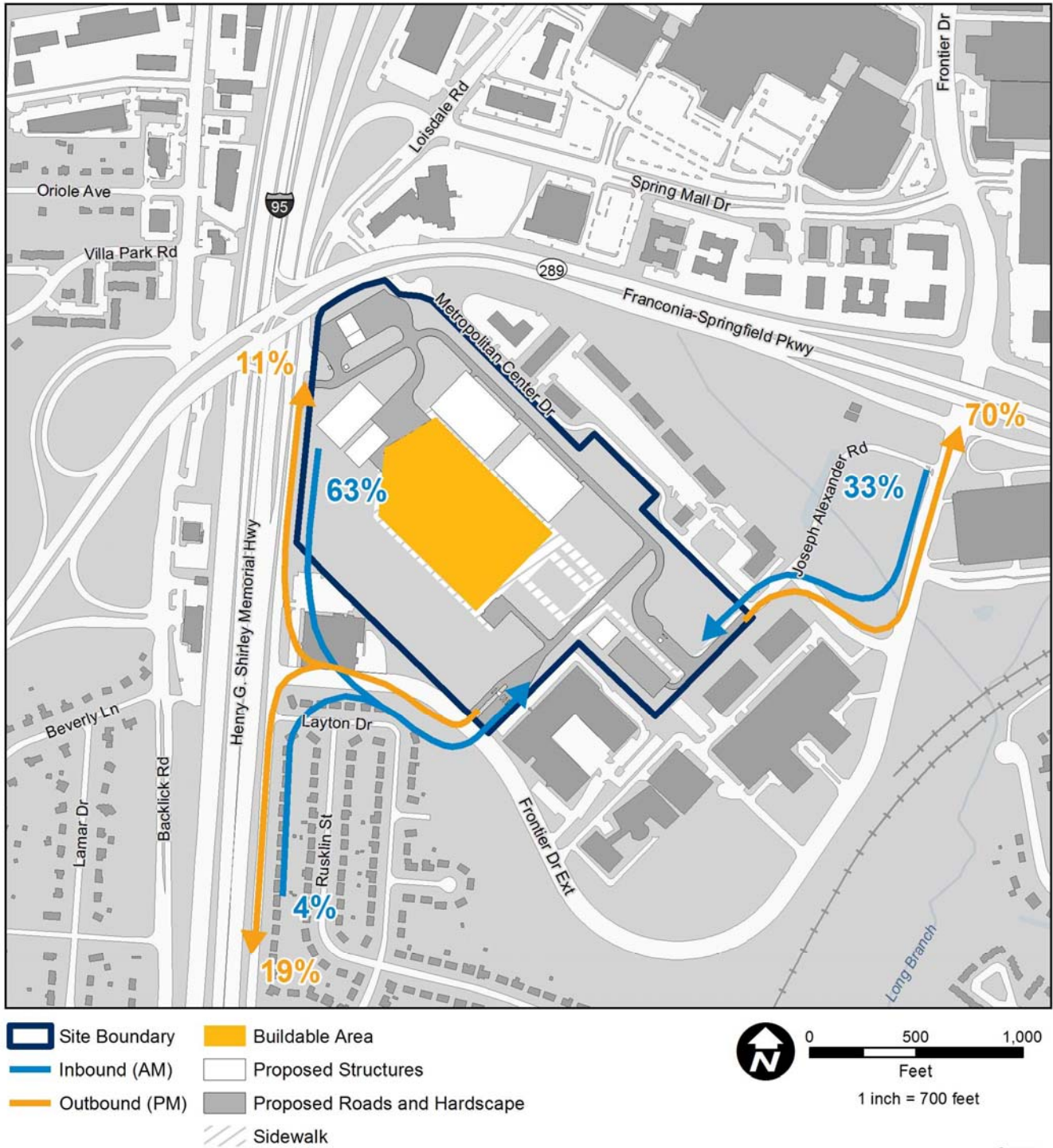


Figure 6-8: Build with Mitigation Condition Lane Geometry (continued)



Note: EB=Eastbound, WB=Westbound, NB=Northbound, SB=Southbound. Intersection #20 operates with a different lane configuration during the AM and PM peak hours.

Figure 6-9: AM Peak Hour Inbound and PM Peak Hour Outbound FBI Vehicle Trip Paths



Sources:
ESRI (2013), GSA (2013)
Fairfax County (2014)

6.6.3 Land Use Impact Summary

This section references the Fairfax County internet-based GIS tool (Fairfax County 2015b) to provide an estimate of property impacts. Several of the proposed recommended mitigation measures might require strip takings of property at two intersections, Loisdale Road at Fairfax County Parkway and Loisdale Road and Frontier Drive Extension (Intersection #s 11 and 8, respectively). The Loisdale Road and Fairfax County Parkway mitigation measures would impact the westbound approach extension of the right-turn lane by 60-feet (assuming the planned roadway improvement would extend the right-turn lane to match the existing left-turn lane distance of 365-feet). The parcel impacted would be the parcel situated on the northeast corner of the intersection. The County is already planning to widen Loisdale Road as part of the planned roadway improvements; therefore, this impact would require the strip taking to be extended another 60 feet beyond what the County is already planning.

The Loisdale Road and the Frontier Drive Extension mitigation measures would have two different approaches, northbound and southbound, that would impact property. Similar to the first intersection, the County is already planning to upgrade this intersection; therefore, the actual strip taking requirement for the mitigation is unknown. To be conservative, the southbound approach would include a 400-foot strip taking to add a second left-turn lane to the intersection and the northbound approach would include a 400-foot strip taking to add a right-turn lane.

Five parcels would be impacted by these mitigation measures, three residential and two commercial-zoned privately-owned properties. Note that these potential impacts are based on conceptual roadway changes. During the design phase, the property impacts would be more defined to identify the total square acres impacted and design measures that could be employed to lessen the impact such as narrowing travel lanes or shifting roadway alignment.

6.6.4 Intersection Operations Analysis

Synchro™ was used to calculate the vehicle delay and LOS operation based on the HCM 2000 method for each study area intersection.

6.6.4.1 Signalized Intersection Operations Analysis

Based on the Synchro™ analysis, all but one signalized study area intersection would operate at acceptable overall conditions during the morning and afternoon peak hours. The following intersection in the study area would operate with overall unacceptable conditions:

- Franconia-Springfield Parkway/Manchester Boulevard and Beulah Street (Intersection #21) would operate at LOS E during the AM peak hour and LOS F during the PM peak hour.

Note that the Build with Mitigation Condition would result in a better operate than the No-build Condition. The LOS during the AM would improve from LOS F to LOS E and the average control delay would improve by 4.4 seconds per vehicle, greater than a 4 percent decrease. During the PM peak hour the overall LOS would not change, but the average control delay would improve by 4.4 seconds, greater than a 4 percent decrease.

Compared to No-build Condition, the same number of intersections would have overall failures in either the AM or PM peak hour.

Based on the Synchro™ analysis, there would be no signalized intersections that would have lane groups or overall approaches with LOS degradation from an acceptable condition (LOS A through LOS D) to an

unacceptable condition (LOS E or LOS F) when compared to the No-build Condition during the morning or afternoon peak hours.

6.6.4.2 *Unsignalized Intersection Operations Analysis*

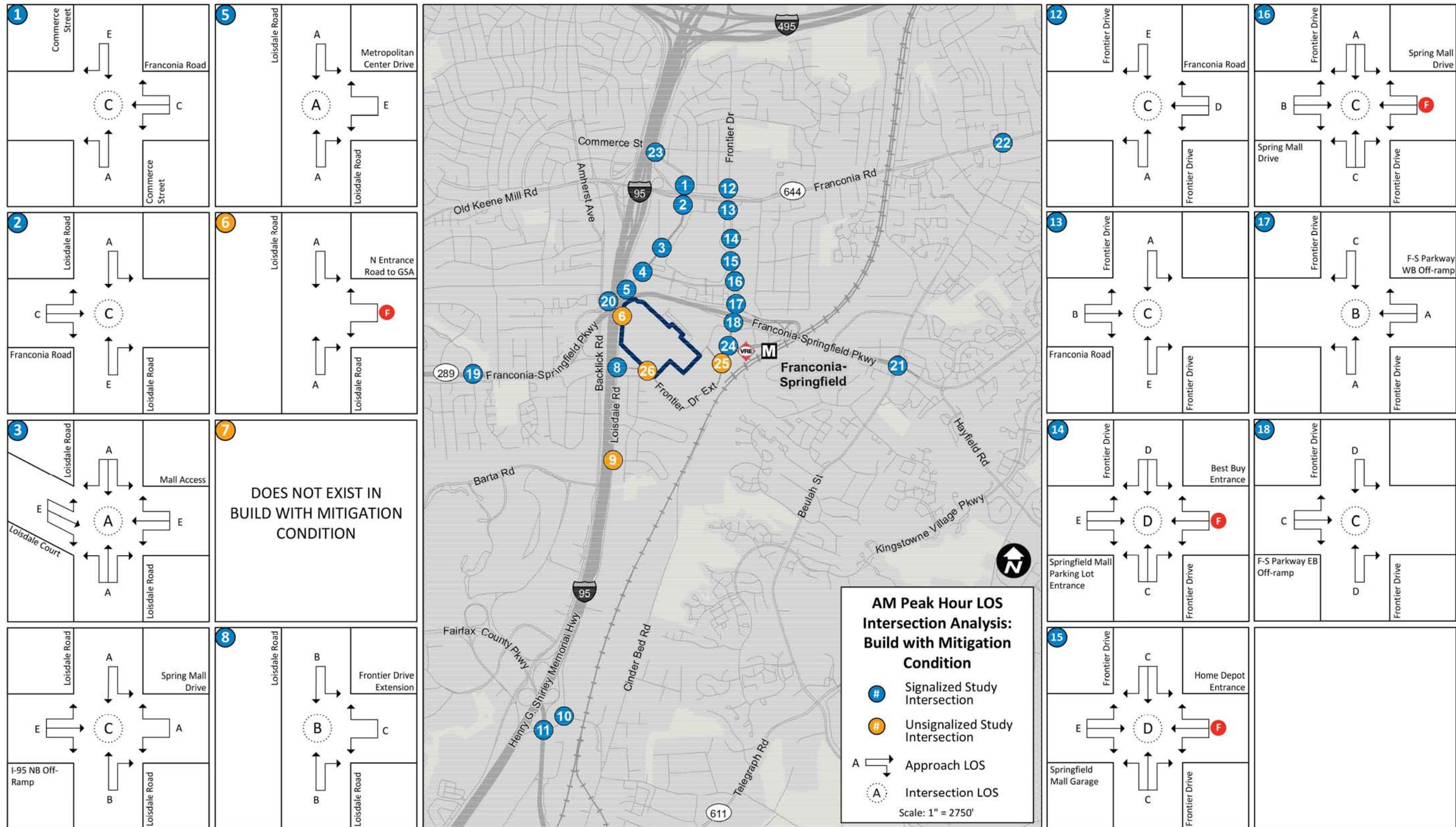
Based on the unsignalized intersection analysis, there would be one unsignalized intersection where the minor approach would operate at an unacceptable condition during the AM and PM peak hours. The intersection of Loisdale Road and the Northern Entrance Road to GSA Facility (Intersection #6) would have a failing minor street approach; however, this approach would operate as the proposed exit from the truck facility and would only affect trucks attempting to turn left when exiting from the Springfield site. It is assumed that the FBI would be scheduling truck arrivals and departures outside of the peak hour, thus not impacting this intersection. If a truck were to depart during the peak hour, the delay would only impact the exiting truck and not the Loisdale Road mainline.

6.6.4.3 *Complete Intersection Operations Analysis*

The average LOS for the various approaches to the intersections and the overall intersection LOS grades for the No-build Condition compared to the Build with Mitigation Condition are depicted in **figures 6-10 and 6-11** for the AM and PM peak hours, respectively. **Table 6-8** shows the results of the LOS capacity analysis and the intersection projected delay under the Build with Mitigation Condition during the AM and PM peak hours.

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Figure 6-10: Build with Mitigation Condition Intersection LOS for AM Peak Hour



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at unacceptable conditions (LOS F and, depending on intersection, also LOS E; see report text for more details). Intersection #23 is analyzed only during the PM peak hour.

Figure 6-10: Build with Mitigation Condition Intersection LOS for AM Peak Hour (continued)

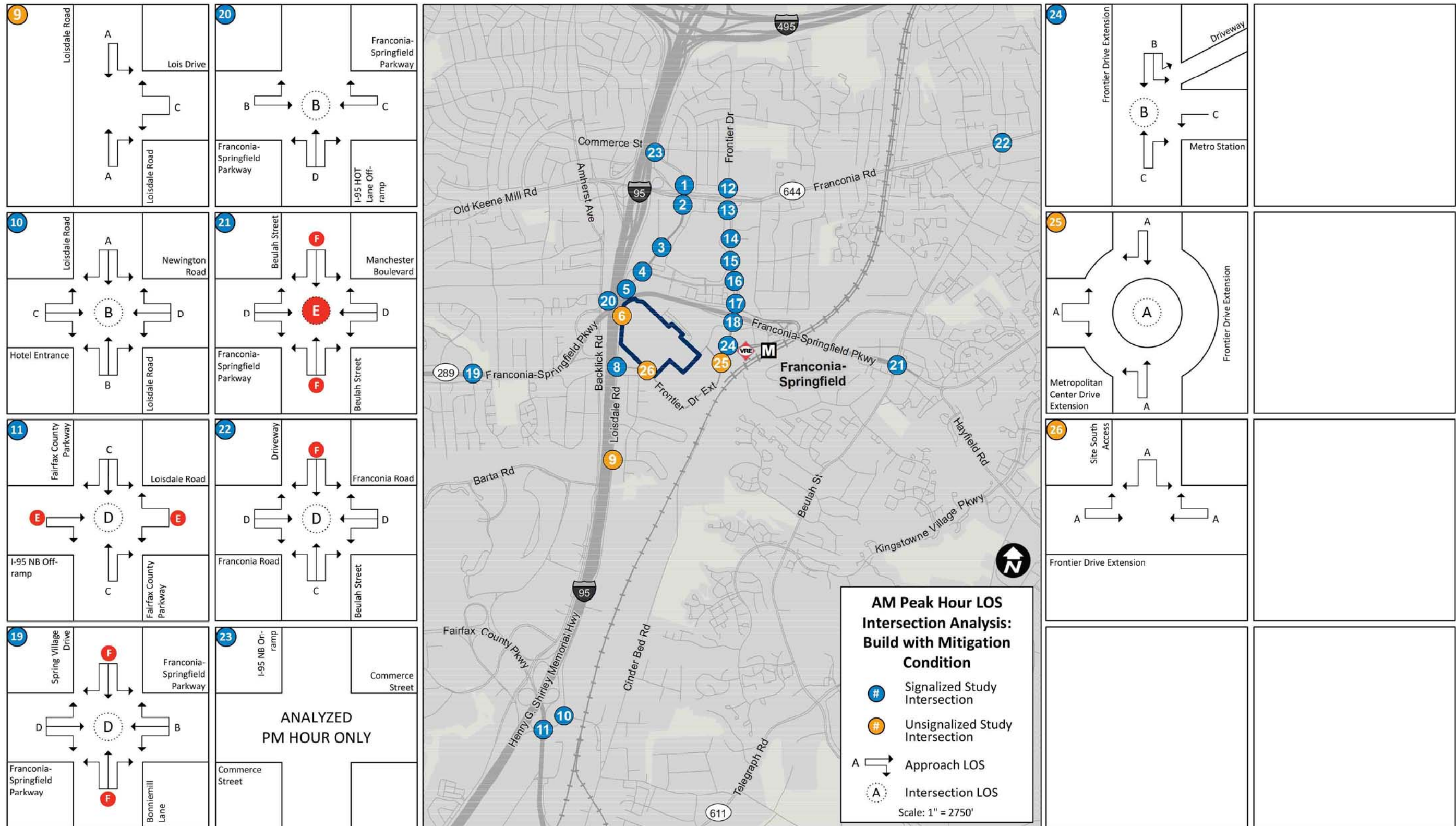


Figure 6-11: Build with Mitigation Condition Intersection LOS for PM Peak Hour

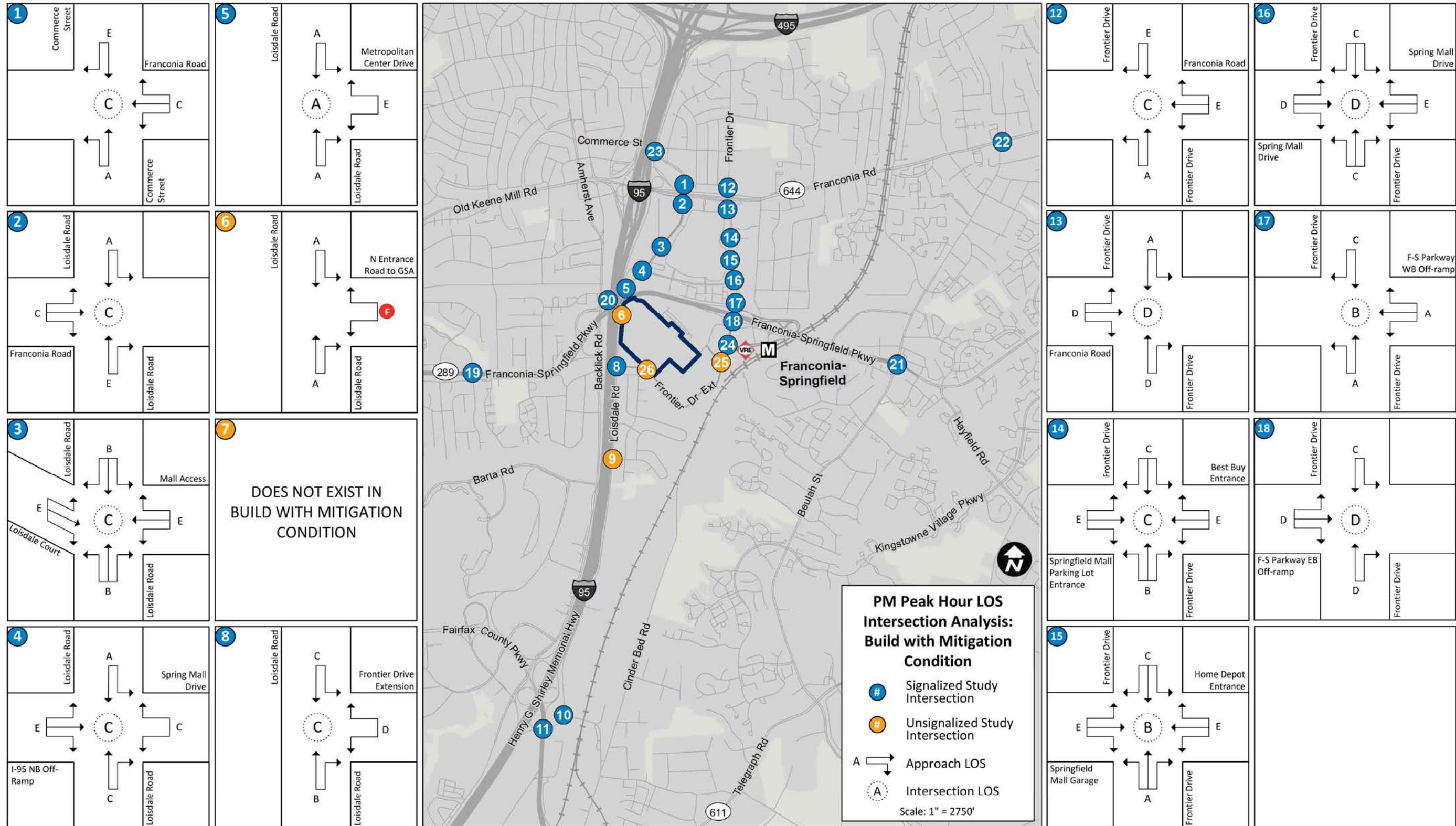
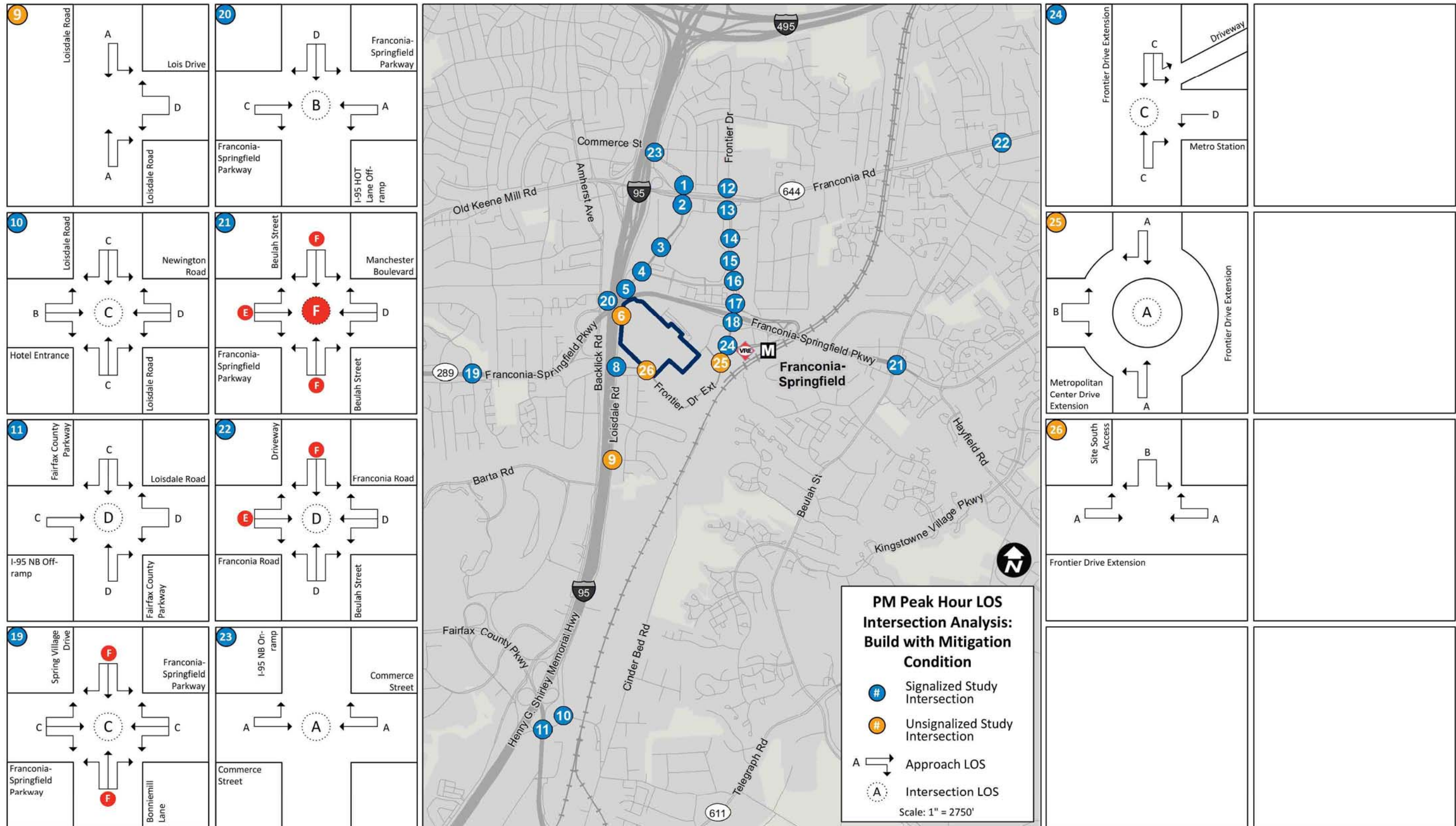


Figure 6-11: Build with Mitigation Condition Intersection LOS for PM Peak Hour (continued)



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at unacceptable conditions (LOS F and, depending on intersection, also LOS E; see report text for more details). Intersection #23 is analyzed only during the PM peak hour.

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
1	Loisdale Road/Commerce Street & Franconia Road (Westbound) (Signalized)													
	WB (Franconia Rd)	L	92.8	F		90.8	F		87.9	F		85.1	F	
	WB (Franconia Rd)	T	29.8	C		32.3	C		29.0	C		48.5	D	
	WB (Franconia Rd)	R	1.5	A		0.8	A		1.5	A		1.6	A	
	WB Overall (Franconia Rd)		20.8	C		25.4	C		20.6	C		32.9	C	
	NB (Commerce St)	L	0.7	A		2.4	A		0.7	A		2.7	A	
	NB (Commerce St)	T	1.5	A		1.9	A		1.5	A		1.8	A	
	NB Overall (Commerce St)		1.1	A		2.3	A		1.1	A		2.4	A	
	SB (Commerce St)	T	70.6	E		73.8	E		69.9	E		78.2	E	
	SB (Commerce St)	R	68.1	E		64.0	E		67.2	E		65.3	E	
	SB Overall (Commerce St)		69.5	E		71.1	E		68.8	E		74.6	E	
	Overall		24.0	C	Pass	31.1	C	Pass	23.8	C	Pass	34.5	C	Pass
2	Loisdale Road/Commerce Street & Franconia Road (Eastbound) (Signalized)													
	EB (Franconia Rd)	L	72.9	E		76.4	E		72.9	E		76.4	E	
	EB (Franconia Rd)	T	38.0	D		52.0	D		41.6	D		51.6	D	
	EB (Franconia Rd)	R	0.7	A		4.9	A		2.0	A		5.1	A	
	EB Overall (Franconia Rd)		23.1	C		21.7	C		21.4	C		21.8	C	
	NB (Loisdale Rd)	T	70.5	E		72.1	E		71.1	E		74.3	E	
	NB (Loisdale Rd)	R	63.4	E		55.4	E		63.4	E		54.5	D	
	NB Overall (Loisdale Rd)		69.0	E		69.5	E		69.5	E		71.4	E	
	SB (Loisdale Rd)	L	2.7	A		0.1	A		2.4	A		0.2	A	
	SB (Loisdale Rd)	T	2.7	A		0.2	A		2.4	A		0.3	A	
	SB Overall (Loisdale Rd)		2.7	A		0.2	A		2.4	A		0.3	A	
	Overall		35.7	D	Pass	32.1	C	Pass	32.6	C	Pass	33.4	C	Pass

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
3	Loisdale Road & Loisdale Court/Mall Access (Signalized)													
	EB (Loisdale Court)	L	74.0	E		76.0	E		74.0	E		76.0	E	
	EB (Loisdale Court)	LT	74.1	E		74.0	E		74.1	E		74.0	E	
	EB (Loisdale Court)	R	65.6	E		53.5	D		65.6	E		53.5	D	
	EB Overall (Loisdale Court)		72.0	E		68.3	E		72.0	E		68.3	E	
	WB (Mall Access)	L	67.6	E		65.1	E		67.6	E		65.1	E	
	WB (Mall Access)	T	67.2	E		53.8	D		67.2	E		53.8	D	
	WB (Mall Access)	R	66.5	E		53.9	D		66.5	E		53.9	D	
	WB Overall (Mall Access)		66.9	E		57.7	E		66.9	E		57.7	E	
	NB (Loisdale Rd)	L	2.1	A		11.9	B		2.8	A		14.1	B	
	NB (Loisdale Rd)	T	3.4	A		12.0	B		4.7	A		12.2	B	
	NB (Loisdale Rd)	R	0.0	A		0.0	A		0.0	A		0.0	A	
	NB Overall (Loisdale Rd)		3.1	A		11.3	B		4.3	A		11.7	B	
	SB (Loisdale Rd)	L	3.2	A		7.0	A		3.2	A		7.3	A	
	SB (Loisdale Rd)	T	5.4	A		13.3	B		6.0	A		13.3	B	
	SB (Loisdale Rd)	R	4.9	A		10.0	B		4.9	A		10.0	B	
	SB Overall (Loisdale Rd)		5.0	A		11.6	B		5.7	A		11.8	B	
	Overall		9.1	A	Pass	21.9	C	Pass	9.2	A	Pass	21.9	C	Pass
4	Loisdale Road & Ramp from NB I-95/Spring Mall Drive (Signalized)													
	EB (Ramp from NB I-95)	L	66.4	E		69.0	E		65.5	E		69.0	E	
	EB (Ramp from NB I-95)	T	67.8	E		68.8	E		66.9	E		68.8	E	
	EB (Ramp from NB I-95)	R	59.1	E		61.4	E		60.5	E		61.5	E	
	EB Overall (Ramp from NB I-95)		66.4	E		68.8	E		64.8	E		68.7	E	
	WB (Spring Mall Dr)	L	17.4	B		68.9	E		17.7	B		69.0	E	
	WB (Spring Mall Dr)	R	119.4	F		52.5	D		0.1	A		0.2	A	
	WB Overall (Spring Mall Dr)		87.8	F		60.1	E		4.1	A		31.7	C	
	NB (Loisdale Rd)	TR	14.9	B		20.5	C		14.3	B		21.4	C	
	NB (Loisdale Rd)	R	8.5	A		16.2	B		8.6	A		22.4	C	
	NB Overall (Loisdale Rd)		13.8	B		19.8	B		13.4	B		21.5	C	
	SB (Loisdale Rd)	L	4.2	A		5.5	A		2.4	A		6.3	A	
	SB (Loisdale Rd)	T	4.6	A		4.1	A		4.3	A		4.2	A	
	SB Overall (Loisdale Rd)		4.5	A		4.7	A		4.0	A		5.0	A	
	Overall		32.9	C	Pass	23.7	C	Pass	22.0	C	Pass	20.6	C	Pass

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
5	Loisdale Road & Metropolitan Center Drive (Signalized)													
	WB (Metropolitan Center Dr)	L	69.0	E		71.6	E		69.1	E		71.6	E	
	WB (Metropolitan Center Dr)	R	68.2	E		69.2	E		68.3	E		69.2	E	
	WB Overall (Metropolitan Center Dr)		68.3	E		69.8	E		68.4	E		69.8	E	
	NB (Loisdale Rd)	T	2.2	A		1.8	A		2.2	A		1.8	A	
	NB (Loisdale Rd)	R	1.6	A		1.4	A		1.6	A		1.4	A	
	NB Overall (Loisdale Rd)		2.2	A		1.8	A		2.2	A		1.8	A	
	SB (Loisdale Rd)	L	0.4	A		0.9	A		1.0	A		1.1	A	
	SB (Loisdale Rd)	T	0.7	A		0.8	A		1.6	A		1.1	A	
	SB Overall (Loisdale Rd)		0.7	A		0.8	A		1.6	A		1.1	A	
	Overall		6.7	A	Pass	4.1	A	Pass	5.6	A	Pass	4.2	A	Pass
6	Loisdale Road & Northern Entrance Road to GSA Facility (Access to Building A, 66808 & 6610 Loisdale Road) (TWSC) ^a													
	WB (N Ent Rd to GSA)	L	31.1	D		0.0	A		^	F		^	F	
	WB (N Ent Rd to GSA)	R	13.6	B		12.2	B		14.0	B		12.8	B	
	WB Overall (N Ent Rd to GSA)		16.5	C		12.2	B		^	F		^	F	
	SB (Loisdale Rd)	L	9.3	A		8.6	A		9.3	A		8.9	A	
	SB Overall (Loisdale Rd)		0.5	-		0.0	-		0.0	-		0.0	-	
	Overall		0.3	-	Pass	0.1	-	Pass	11.2	-	Pass	6.8	-	Pass
7	Loisdale Road & Southern Entrance Road to GSA Facility (Access to Building B, 7000 Loisdale Road) (TWSC)													
	WB (S Ent Rd to GSA)	L	51.4	F		41.1	E		-	-		-	-	
	WB (S Ent Rd to GSA)	R	13.3	B		11.2	B		-	-		-	-	
	WB Overall (S Ent Rd to GSA)		20.2	C		17.7	C		-	-		-	-	
	SB (Loisdale Rd)	L	10.2	B		8.3	A		-	-		-	-	
	SB Overall (Loisdale Rd)		2.1	-		0.1	-		-	-		-	-	
	Overall		1.6	-	Pass	0.9	-	Pass	-	-	-	-	-	-
8	Loisdale Road & Frontier Drive Extension (Signalized)													
	WB (Frontier Dr Ext)	L/LR	31.4	C		51.1	D		33.5	C		43.0	D	
	WB (Frontier Dr Ext)	R	28.1	C		27.5	C		-	-		-	-	
	WB Overall (Frontier Dr Ext)		30.8	C		47.5	D		33.5	C		43.0	D	
	NB (Loisdale Rd)	T	11.8	B		13.1	B		18.9	B		14.9	B	
	NB (Loisdale Rd)	R	8.1	A		9.9	A		12.2	B		11.2	B	
	NB Overall (Loisdale Rd)		10.5	B		12.7	B		16.3	B		14.5	B	
	SB (Loisdale Rd)	L	5.6	A		7.0	A		14.9	B		7.6	A	
	SB (Loisdale Rd)	T	3.4	A		22.2	C		2.9	A		24.0	C	
	SB Overall (Loisdale Rd)		3.8	A		21.4	C		11.0	B		22.8	C	
	Overall		9.2	A	Pass	23.8	C	Pass	14.6	B	Pass	26.8	C	Pass

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition						
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	
9	Loisdale Road & Lois Drive (TWSC)														
	WB (Lois Drive Dr)	LR	16.7	C		21.7	C		17.1	C		25.5	D		
	WB Overall (Lois Drive Dr)		16.7	C	Pass	21.7	A	Pass	17.1	C	Pass	25.5	D	Pass	
	SB (Loisdale Rd)	L	9.1	A		8.3	C		9.2	A		8.3	A		
	SB Overall (Loisdale Rd)		0.3	-	Pass	0.1	-	Pass	0.3	-	Pass	0.1	-	Pass	
	Overall		0.7	-	Pass	0.3	-	Pass	0.7	-	Pass	0.3	-	Pass	
10	Loisdale Road & Hotel Entrance/Newington Road (Signalized)														
	EB (Hotel Entrance)	LTR	30.7	C		18.0	B		30.7	C		18.0	B		
	EB Overall (Hotel Entrance)		30.7	C	Pass	18.0	B	Pass	30.7	C	Pass	18.0	B	Pass	
	WB (Newington Rd)	LT	46.1	D		59.0	E		46.1	D		59.0	E		
	WB (Newington Rd)	R	28.4	C		18.4	B		28.4	C		18.4	B		
	WB Overall (Newington Rd)		38.8	D	Pass	50.1	D	Pass	38.8	D	Pass	50.1	D	Pass	
	NB (Loisdale Rd)	L	8.4	A		18.6	B		8.3	A		19.4	B		
	NB (Loisdale Rd)	T	9.4	A		19.4	B		9.8	A		24.2	C		
	NB (Loisdale Rd)	R	14.8	B		31.7	C		15.0	B		51.6	D		
	NB Overall (Loisdale Rd)		11.1	B	Pass	23.6	C	Pass	11.4	B	Pass	33.1	C	Pass	
	SB (Loisdale Rd)	L	7.6	A		27.5	C		7.7	A		27.5	C		
	SB (Loisdale Rd)	T	8.5	A		25.6	C		8.6	A		29.0	C		
	SB (Loisdale Rd)	R	8.0	A		17.9	B		8.0	A		17.9	B		
	SB Overall (Loisdale Rd)		8.2	A	Pass	26.0	C	Pass	8.2	A	Pass	28.6	C	Pass	
	Overall		16.7	B	Pass	31.6	C	Pass	16.8	B	Pass	34.4	C	Pass	
11	Loisdale Road/I-95 (N) Ramp C & D & Fairfax County Parkway (Signalized)														
	EB (I-95 Northbound Off-Ramp)	T	117.0	F		84.6	F		117.0	F		84.6	F		
	EB (I-95 Northbound Off-Ramp)	R	0.3	A		0.2	A		0.3	A		0.2	A		
	EB Overall (I-95 Northbound Off-Ramp)		55.5	E	Fail	27.3	C	Pass	55.5	E	Fail	27.3	C	Pass	
	WB (Loisdale Rd)	L	125.3	F		74.5	E		126.7	F		73.4	E		
	WB (Loisdale Rd)	R	43.1	D		37.1	D		43.3	D		41.7	D		
	WB Overall (Loisdale Rd)		69.5	E	Fail	48.1	D	Pass	70.3	E	Fail	50.6	D	Pass	
	NB (Fairfax County Pkwy)	T	29.6	C		49.3	D		29.6	C		54.8	D		
	NB (Fairfax County Pkwy)	R	24.3	C		9.5	A		24.9	C		9.1	A		
	NB Overall (Fairfax County Pkwy)		28.7	C	Pass	46.2	D	Pass	28.7	C	Pass	51.3	D	Pass	
	SB (Fairfax County Pkwy)	L	84.0	F		97.1	F		83.9	F		103.3	F		
	SB (Fairfax County Pkwy)	T	30.6	C		23.4	C		30.6	C		26.2	C		
	SB (Fairfax County Pkwy)	R	0.8	A		1.0	A		0.8	A		1.0	A		
	SB Overall (Fairfax County Pkwy)		31.2	C	Pass	24.5	C	Pass	31.2	C	Pass	26.8	C	Pass	
	Overall		35.7	D	Pass	37.7	D	Pass	35.7	D	Pass	41.3	D	Pass	

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
12	Frontier Drive & Franconia Road (Westbound) (Signalized)													
	WB (Franconia Rd)	L	73.3	E		64.3	E		74.7	E		74.1	E	
	WB (Franconia Rd)	TR	44.2	D		35.3	D		47.4	D		50.8	D	
	WB Overall (Franconia Rd)		48.0	D		41.2	D		51.0	D		55.6	E	
	NB (Frontier Dr)	L	6.1	A		3.5	A		5.4	A		3.8	A	
	NB (Frontier Dr)	T	2.6	A		1.5	A		2.2	A		0.6	A	
	NB Overall (Frontier Dr)		5.9	A		3.3	A		5.3	A		3.5	A	
	SB (Frontier Dr)	TR	73.1	E		65.7	E		77.4	E		65.3	E	
	SB Overall (Frontier Dr)		73.1	E		65.7	E		77.4	E		65.3	E	
	Overall		30.7	C	Pass	24.6	C	Pass	32.2	C	Pass	26.6	C	Pass
13	Frontier Drive & Franconia Road (Eastbound) (Signalized)													
	EB (Franconia Rd)	L	46.1	D		49.8	D		41.6	D		62.9	E	
	EB (Franconia Rd)	T	26.7	C		30.4	C		25.1	C		77.9	E	
	EB (Franconia Rd)	R	0.6	A		0.6	A		1.0	A		0.7	A	
	EB Overall (Franconia Rd)		12.5	B		18.2	B		10.1	B		41.6	D	
	NB (Frontier Dr)	T	67.1	E		43.6	D		60.5	E		47.1	D	
	NB (Frontier Dr)	R	54.9	D		76.0	E		51.0	D		36.5	D	
	NB Overall (Frontier Dr)		64.9	E		51.3	D		58.8	E		45.1	D	
	SB (Frontier Dr)	LT	3.3	A		2.9	A		4.4	A		2.1	A	
	SB Overall (Frontier Dr)		3.3	A		2.9	A		4.4	A		2.1	A	
	Overall		38.5	D	Pass	31.5	C	Pass	33.0	C	Pass	39.8	D	Pass
14	Frontier Drive & Best Buy/Springfield Mall Lot Entrance (Signalized)													
	EB (Springfield Mall Lot Ent)	L	80.2	F		79.1	E		80.2	F		78.5	E	
	EB (Springfield Mall Lot Ent)	LTR	77.1	E		67.7	E		77.1	E		67.7	E	
	EB Overall (Springfield Mall Parking Lot E		78.1	E		72.7	E		78.1	E		72.4	E	
	WB (Best Buy Ent)	L	207.5	F		77.3	E		207.5	F		77.3	E	
	WB (Best Buy Ent)	TR	22.6	C		67.4	E		22.6	C		67.4	E	
	WB Overall (Best Buy Ent)		148.2	F		72.2	E		148.2	F		72.2	E	
	NB (Frontier Dr)	L	105.9	F		101.9	F		104.9	F		104.3	F	
	NB (Frontier Dr)	T	29.4	C		6.9	A		30.4	C		5.5	A	
	NB (Frontier Dr)	R	37.2	D		16.9	B		37.2	D		8.7	A	
	NB Overall (Frontier Dr)		32.1	C		17.6	B		33.1	C		13.1	B	
	SB (Frontier Dr)	L	93.3	F		69.9	E		93.3	F		79.0	E	
	SB (Frontier Dr)	T	43.6	D		15.7	B		46.1	D		22.1	C	
	SB (Frontier Dr)	R	37.4	D		35.4	D		37.4	D		20.5	C	
	SB Overall (Frontier Dr)		46.8	D		26.6	C		48.4	D		29.2	C	
	Overall		41.8	D	Pass	30.8	C	Pass	43.3	D	Pass	26.7	C	Pass

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
15	Frontier Drive & Home Depot/Springfield Mall Garage Entrance (Signalized)													
	EB (Springfield Mall Garage Ent)	LT	80.6	F		76.7	E		80.6	F		77.3	E	
	EB (Springfield Mall Garage Ent)	R	74.1	E		74.1	E		74.1	E		74.4	E	
	EB Overall (Springfield Mall Garage Ent)		76.7	E		74.9	E		76.7	E		75.3	E	
	WB (Home Depot Ent)	LTR	247.0	F		75.3	E		247.0	F		75.3	E	
	WB Overall (Home Depot Ent)		247.0	F		75.3	E		247.0	F		75.3	E	
	NB (Frontier Dr)	L	212.1	F		87.0	F		218.7	F		86.1	F	
	NB (Frontier Dr)	T	20.4	C		5.0	A		20.3	C		4.1	A	
	NB (Frontier Dr)	R	6.2	A		2.6	A		6.2	A		0.7	A	
	NB Overall (Frontier Dr)		20.7	C		6.2	A		20.7	C		4.9	A	
	SB (Frontier Dr)	L	92.2	F		81.7	F		91.1	F		82.8	F	
	SB (Frontier Dr)	T	8.6	A		8.2	A		13.0	B		7.3	A	
	SB (Frontier Dr)	R	0.0	A		0.0	A		0.0	A		0.0	A	
	SB Overall (Frontier Dr)		21.1	C		21.5	C		22.1	C		20.6	C	
	Overall		37.3	D	Pass	19.8	B	Pass	36.5	D	Pass	16.3	B	Pass
16	Frontier Drive & Spring Mall Drive (Signalized)													
	EB (Spring Mall Dr)	L	54.3	D		57.2	E		49.9	D		57.8	E	
	EB (Spring Mall Dr)	LT	54.4	D		57.2	E		50.0	D		57.8	E	
	EB (Spring Mall Dr)	R	11.8	B		39.1	D		12.2	B		39.2	D	
	EB Overall (Spring Mall Dr)		20.5	C		41.8	D		19.9	B		42.1	D	
	WB (Spring Mall Dr)	LT	99.8	F		76.8	E		99.8	F		76.8	E	
	WB (Spring Mall Dr)	R	62.3	E		56.7	E		62.3	E		56.6	E	
	WB Overall (Spring Mall Dr)		84.8	F		69.6	E		84.8	F		69.6	E	
	NB (Frontier Dr)	L	69.3	E		67.4	E		69.4	E		67.1	E	
	NB (Frontier Dr)	T	14.6	B		24.4	C		14.6	B		22.4	C	
	NB (Frontier Dr)	R	11.0	B		16.6	B		11.0	B		6.4	A	
	NB Overall (Frontier Dr)		27.1	C		70.3	E		26.4	C		31.0	C	
	SB (Frontier Dr)	L	92.1	F		70.3	E		88.7	F		74.7	E	
	SB (Frontier Dr)	T	6.3	A		27.1	C		4.6	A		24.2	C	
	SB (Frontier Dr)	R	18.4	B		33.4	C		17.8	B		33.0	C	
	SB Overall (Frontier Dr)		9.9	A		29.7	C		7.4	A		27.3	C	
	Overall		22.8	C	Pass	38.4	D	Pass	20.9	C	Pass	35.1	D	Pass

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
17	Frontier Drive & Franconia-Springfield Parkway (Westbound) (Signalized)													
	WB (F-S Pkwy WB Off-ramp)	L	51.5	D		75.3	E		53.9	D		66.0	E	
	WB (F-S Pkwy WB Off-ramp)	LT	51.4	D		75.1	E		53.9	D		66.0	E	
	WB (F-S Pkwy WB Off-ramp)	R	2.2	A		4.4	A		2.1	A		4.4	A	
	WB Overall (F-S Pkwy WB Off-ramp)		6.1	A		7.9	A		8.0	A		7.5	A	
	NB (Frontier Dr)	L	1.2	A		4.8	A		5.7	A		26.6	C	
	NB (Frontier Dr)	T	3.0	A		9.9	A		3.3	A		3.0	A	
	NB Overall (Frontier Dr)		3.0	A		9.6	A		3.4	A		6.1	A	
	SB (Frontier Dr)	T	69.2	E		21.7	C		21.9	C		21.3	C	
	SB (Frontier Dr)	R	44.2	D		25.8	C		18.3	B		23.6	C	
	SB Overall (Frontier Dr)		66.3	E		23.3	C		21.5	C		22.2	C	
	Overall		31.3	C	Pass	15.5	B	Pass	13.3	B	Pass	13.0	B	Pass
18	Frontier Drive & Franconia-Springfield Parkway (Eastbound) (Signalized)													
	EB (F-S Pkwy EB Off-ramp)	L	30.7	C		82.1	F		45.3	D		49.1	D	
	EB (F-S Pkwy EB Off-ramp)	LT	30.8	C		82.8	F		45.4	D		49.2	D	
	EB (F-S Pkwy EB Off-ramp)	R	121.6	F		61.3	E		27.0	C		44.7	D	
	EB Overall (F-S Pkwy EB Off-ramp)		87.0	F		74.2	E		33.2	C		47.4	D	
	NB (Frontier Dr)	T	49.4	D		58.4	E		48.3	D		49.0	D	
	NB (Frontier Dr)	R	48.8	D		55.4	E		47.7	D		40.0	D	
	NB Overall (Frontier Dr)		49.3	D		57.9	E		48.1	D		48.2	D	
	SB (Frontier Dr)	L	1.1	A		1.6	A		25.4	C		35.3	D	
	SB (Frontier Dr)	T	5.4	A		1.0	A		38.9	D		28.9	C	
	SB Overall (Frontier Dr)		4.1	A		1.4	A		35.3	D		32.8	C	
	Overall		47.6	D	Pass	32.1	C	Pass	34.7	C	Pass	41.8	D	Pass

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
19	Franconia-Springfield Parkway & Spring Village Drive/Bonniemill Lane (Signalized)													
	EB (Franconia-Springfield Pkwy)	L	160.7	F		140.4	F		160.7	F		140.4	F	
	EB (Franconia-Springfield Pkwy)	T	43.8	D		20.4	C		53.2	D		20.4	C	
	EB (Franconia-Springfield Pkwy)	R	6.5	A		15.3	B		6.5	A		15.3	B	
	EB Overall (Franconia-Springfield Pkwy)		44.8	D	Pass	22.7	C	Pass	54.0	D	Pass	22.8	C	Pass
	WB (Franconia-Springfield Pkwy)	L	272.2	F		106.7	F		272.2	F		106.7	F	
	WB (Franconia-Springfield Pkwy)	T	8.2	A		19.2	B		8.2	A		21.2	C	
	WB (Franconia-Springfield Pkwy)	R	7.2	A		6.3	A		7.2	A		6.3	A	
	WB Overall (Franconia-Springfield Pkwy)		19.8	B	Pass	23.3	C	Pass	19.7	B	Pass	25.0	C	Pass
	NB (Bonniemill Ln)	L	123.1	F		86.9	F		123.1	F		86.9	F	
	NB (Bonniemill Ln)	T	121.2	F		86.3	F		121.2	F		86.3	F	
	NB (Bonniemill Ln)	R	171.6	F		86.8	F		171.6	F		86.8	F	
	NB Overall (Bonniemill Ln)		166.2	F	Fail	86.8	F	Fail	166.2	F	Fail	86.8	F	Fail
	SB (Spring Village Dr)	L	148.2	F		117.3	F		148.2	F		117.3	F	
	SB (Spring Village Dr)	T	121.2	F		86.5	F		121.2	F		86.5	F	
	SB (Spring Village Dr)	R	121.5	F		86.8	F		121.5	F		86.8	F	
	SB Overall (Spring Village Dr)		139.6	F	Fail	105.2	F	Fail	139.6	F	Fail	105.2	F	Fail
	Overall		46.8	D	Pass	27.6	C	Pass	53.4	D	Pass	28.7	C	Pass
20	Franconia-Springfield Parkway & I-95 HOT Lane Ramps (Signalized)^b													
	EB (Franconia-Springfield Pkwy)	L (AM)	36.8	D		-	-		39.4	D		-	-	
	EB (Franconia-Springfield Pkwy)	T	10.9	B		25.7	C		11.4	B		25.7	C	
	EB (Franconia-Springfield Pkwy)	R (PM)	-	-		16.8	B		-	-		16.8	B	
	EB Overall (Franconia-Springfield Pkwy)		14.4	B	Pass	25.5	C	Pass	15.0	B	Pass	25.6	C	Pass
	WB (Franconia-Springfield Pkwy)	L (PM)	-	-		35.2	D		-	-		35.2	D	
	WB (Franconia-Springfield Pkwy)	T	21.8	C		5.7	A		21.8	C		6.2	A	
	WB (Franconia-Springfield Pkwy)	R (AM)	17.4	B		-	-		17.5	B		-	-	
	WB Overall (Franconia-Springfield Pkwy)		21.2	C	Pass	7.6	A	Pass	21.2	C	Pass	8.0	A	Pass
	NB (I-95 HOT Lane Off-ramp)	LTR (AM)	39.2	D		-	-		42.5	D		-	-	
	NB Overall (I-95 HOT Lane Off-ramp)		39.2	D	Pass	-	-	Pass	42.5	D	Pass	-	-	Pass
	SB (I-95 HOT Lane Off-ramp)	LTR (PM)	-	-		41.0	D		-	-		41.0	D	
	SB (I-95 HOT Lane Off-ramp)	R (PM)	-	-		40.1	D		-	-		40.1	D	
	SB Overall (I-95 HOT Lane Off-ramp)		-	-	Pass	40.6	D	Pass	-	-	Pass	40.6	D	Pass
	Overall		17.5	B	Pass	15.8	B	Pass	18.0	B	Pass	15.9	B	Pass

Table 6-8: No-build Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
21	Franconia-Springfield Parkway/Manchester Boulevard & Beulah Street (Signalized)													
	EB (Franconia-Springfield Pkwy)	L	85.5	F		81.8	F		85.5	F		81.8	F	
	EB (Franconia-Springfield Pkwy)	T	36.3	D		65.6	E		36.3	D		70.7	E	
	EB (Franconia-Springfield Pkwy)	R	32.9	C		53.0	D		32.9	C		53.6	D	
	EB Overall (Franconia-Springfield Pkwy)		49.6	D	Pass	64.7	E	Fail	49.6	D	Pass	67.7	E	Fail
	WB (Manchester Blvd)	L	77.7	E		112.4	F		77.7	E		112.4	F	
	WB (Manchester Blvd)	T	83.4	F		77.9	E		49.6	D		49.0	D	
	WB (Manchester Blvd)	R	37.7	D		36.7	D		37.7	D		37.4	D	
	WB Overall (Manchester Blvd)		76.8	E	Fail	76.5	E	Fail	49.6	D	Pass	53.6	D	Pass
	NB (Beulah St)	L	168.3	F		214.3	F		168.3	F		214.3	F	
	NB (Beulah St)	T	65.8	E		78.2	E		65.8	E		78.2	E	
	NB (Beulah St)	R	48.1	D		63.0	E		48.1	D		63.0	E	
	NB Overall (Beulah St)		119.6	F	Fail	146.6	F	Fail	119.6	F	Fail	146.6	F	Fail
	SB (Beulah St)	L	73.9	E		89.5	F		73.9	E		89.5	F	
	SB (Beulah St)	T	161.6	F		201.2	F		161.6	F		201.2	F	
	SB (Beulah St)	R	79.1	E		74.9	E		79.1	E		74.9	E	
	SB Overall (Beulah St)		114.8	F	Fail	137.8	F	Fail	114.8	F	Fail	137.8	F	Fail
	Overall		84.1	F	Fail	96.9	F	Fail	77.2	E	Fail	92.5	F	Fail
22	Franconia Road & Beulah Street (Signalized)													
	EB (Franconia Rd)	L	40.7	D		39.9	D		41.4	D		46.3	D	
	EB (Franconia Rd)	TR	49.6	D		60.2	E		48.8	D		72.8	E	
	EB Overall (Franconia Rd)		49.5	D	Pass	60.0	E	Fail	48.8	D	Pass	72.6	E	Fail
	WB (Franconia Rd)	L	64.3	E		100.1	F		64.1	E		74.4	E	
	WB (Franconia Rd)	TR	18.4	B		17.5	B		18.5	B		14.9	B	
	WB Overall (Franconia Rd)		39.4	D	Pass	49.3	D	Pass	39.1	D	Pass	37.8	D	Pass
	NB (Beulah St)	LT	51.5	D		60.6	E		51.5	D		70.4	E	
	NB (Beulah St)	R	28.1	C		23.3	C		28.2	C		24.1	C	
	NB Overall (Beulah St)		31.3	C	Pass	34.4	C	Pass	31.4	C	Pass	37.9	D	Pass
	SB (Driveway)	LTR	129.3	F		164.6	F		129.3	F		164.6	F	
	SB Overall (Driveway)		129.3	F	Fail	164.6	F	Fail	129.3	F	Fail	164.6	F	Fail
	Overall		39.9	D	Pass	51.1	D	Pass	39.6	D	Pass	50.3	D	Pass

Table 6-8: No-build Condition Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
23	I-95 NB On-ramp & Commerce Street (Signalized) ^c													
	EB (Commerce St)	L	-	-		1.8	A		-	-		1.8	A	
	EB (Commerce St)	T	-	-		0.1	A		-	-		0.1	A	
	EB Overall (Commerce St)		-	-		0.2	A		-	-		0.2	A	
	WB (Commerce St)	T	-	-		6.1	A		-	-		6.1	A	
	WB (Commerce St)	R	-	-		5.4	A		-	-		5.8	A	
	WB Overall (Commerce St)		-	-		2.8	A		-	-		6.0	A	
	Overall		-	-	-	2.8	A	Pass	-	-	-	3.1	A	Pass
24	Frontier Drive Extension & Metro Station (Signalized)													
	WB (Metro Station)	L	31.3	C		23.4	C		30.1	C		42.0	D	
	WB Overall (Metro Station)		31.3	C		23.4	C		30.1	C		42.0	D	
	NB (Frontier Dr Ext)	T	27.1	C		22.0	C		30.6	C		26.5	C	
	NB (Frontier Dr Ext)	R	30.1	C		19.4	B		34.0	C		17.0	B	
	NB Overall (Frontier Dr Ext)		29.2	C		22.0	C		32.9	C		26.4	C	
	SB (Frontier Dr Ext) to Driveway	L	23.6	C		21.2	C		28.7	C		39.6	D	
	SB (Frontier Dr Ext)	L	14.5	B		18.2	B		17.0	B		32.6	C	
	SB (Frontier Dr Ext)	T	0.1	A		0.0	A		0.2	A		0.0	A	
	SB Overall (Frontier Dr Ext)		14.3	B		16.0	B		14.1	B		28.3	C	
	Overall		16.4	B	Pass	18.7	B	Pass	16.5	B	Pass	28.2	C	Pass
25	Frontier Drive Extension & Metropolitan Center Drive Extension ^d													
	EB (Metropolitan Center Dr Ext)	LR	14.8	B		13.3	B		4.3	A		10.5	B	
	EB (Metropolitan Center Dr Ext)	R	-	-		-	-		-	-		-	-	
	EB Overall (Metropolitan Center Dr Ext)		14.8	B		13.3	B		4.3	A		10.5	B	
	NB (Frontier Dr Ext)	LT	4.3	A		1.4	A		4.6	A		8.6	A	
	NB (Frontier Dr Ext)	T							4.8	A		8.5	A	
	NB Overall (Frontier Dr Ext)		2.1	-		0.5	-		4.7	A		8.6	A	
	SB (Frontier Dr Ext)	TR/T	-	-		-	-		4.4	A		4.0	A	
	SB (Frontier Dr Ext)	T							4.5	A		4.4	A	
	SB Overall (Frontier Dr Ext)		-	-		-	-		1.4	A		2.7	A	
	Overall		2.1	-	Pass	4.7	-	Pass	2.3	A	Pass	7.9	A	Pass

Table 6-8 No-build Condition Compared to the Build with Mitigation Condition Intersection AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	No-build Condition						Build with Mitigation Condition					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check	Delay (sec/veh)	LOS	Check
26	Frontier Drive Extension & Site South Access (TWSC)													
	EB (Frontier Dr Ext)	L	-	-		-	-		9.5	A		8.1	A	
	EB (Frontier Dr Ext)	LT	-	-		-	-		-	-		-	-	
	EB Overall (Frontier Dr Ext)		-	-		-	-		5.8	-		1.6	-	
	WB (Frontier Dr Ext)	TR	-	-		-	-		-	-		-	-	
	WB Overall (Frontier Dr Ext)		-	-		-	-		-	-		-	-	
	SB (Site South Access)	L	-	-		-	-		0.0	A		0.0	A	
	SB (Site South Access)	R	-	-		-	-		8.7	A		11.9	B	
	SB Overall (Site South Access)		-	-		-	-		8.7	A		11.9	B	
	Overall		-	-	-	-	-	-	5.7	-	Pass	5.0	-	Pass

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LOS = Level of Service

LTR = left / through / right lanes

LTR/LTR = No-Build/Build with Mitigation

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

Delay is Measured in Seconds Per Vehicle.

Red cells denote intersections operating at unacceptable conditions.

[^] Highway Capacity Manual unable to report accurate delay using default gap acceptance values

^a Intersection #7 would be removed for the Build with Mitigation Condition.

^b Intersection continues to operate with a different lane configuration during the AM and PM peak hours.

^c Intersection not analyzed during the AM peak hour

^d Intersection would operate as a TWSC intersection under the No-build Condition and a roundabout under the Build with Mitigation condition.

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6.6.5 Queuing Analysis

Synchro™ was used to calculate the 50th percentile queue lengths and SimTraffic™ was used to calculate the 95th percentile queue lengths. The SimTraffic simulations have a statistical accuracy of plus or minus 4.8 percent error for the AM peak hour and 4.9 percent error for the PM peak hour simulations. Based on the Synchro™ and SimTraffic™ analysis, there would be one signalized and two unsignalized intersection approaches would experience failing queue lengths in excess of 150 feet of the No-build Condition length. The lane group within the approach that would be operating under unacceptable conditions is noted in parenthesis. These intersections are as follows:

- Frontier Drive and Franconia-Springfield Parkway Intersection (Intersections #17 and #18)

Note that these intersections would operate as one coordinated intersection and queues would occur between them and not affect any upstream or downstream intersections

- Southbound Frontier Drive (through movements) during the AM peak hour
- Southbound Frontier Drive (left turns) during the PM peak hour
 - The recommended mitigation for this complex intersection would include specific timing adjustments affecting the operation of both intersections. Currently, Frontier Drive has eight separate travel lanes under the Franconia-Springfield Parkway overpass, four in the southbound direction and four in the northbound direction. The traffic signal is timed to allow access to the northbound and southbound travel lanes at separate times where vehicles using either direction are cleared before the reverse direction occurs. The recommended mitigation would change the traffic signal timings to allow the southbound lanes to store vehicles under the Franconia-Springfield Parkway overpass while they wait to turn left onto Franconia-Springfield Parkway eastbound or proceed south on Frontier Drive toward the Metro station. During the time the southbound vehicles are stored, the reverse moves traveling northbound would occur. This would improve the intersection vehicle throughput and use available pavement to the fullest extent. Under the 95th percentile queue length, a queue might occur that extends back through the north side of the Frontier Drive and Franconia-Springfield Parkway intersection (Intersection #17). Vehicle moves at the north side (Intersection #17) would not be impacted because the queue beyond that point would not impact the next upstream intersection (Spring Mall Drive).

- Loisdale Road and the Northern Entrance Road to GSA Facility (Intersection #6)

Note that this facility would operate as a truck-only access to the Springfield site and would only impact exiting trucks attempting to make a left turn

- Frontier Drive Extension and Metropolitan Center Drive Extension intersection (Intersection #25)

Note that the driveway serving the Springfield Metro Center Phase II planned office development is currently designed too close to the proposed roundabout with the Frontier Drive Extension and would need to be moved further west. It is recommended to work with the planned development to move the driveway further west to allow more queue space leading into the proposed roundabout.

6.6.5.1 On-ramp Lane Drop Queuing Analysis

Because Synchro™/SimTraffic™ are tools primarily designed to measure the operations and delay at signalized and unsignalized intersections, these tools are not meant to model the effect of merges caused by a lane drop on an on-ramp to a freeway facility. They tend to show worse conditions than would actually occur. There is a major on-ramp from Franconia Road westbound providing connection to several Interstates (I-95, I-395, and I-495). This ramp begins as a two-lane ramp, but quickly splits 300-feet downstream with vehicles destined to I-95 southbound using the right lane and all other destinations using the left-lane. Based on the Build with Mitigation Condition, it is forecasted that this two-lane ramp would carry 2,088 vehicles per hour with 1,695 of them (81 percent) requiring the use of the left lane. Assuming a 50/50 split between the lanes, this would result in 30 percent of the vehicles using the right lane needing to merge into the left lane.

Because Synchro™/SimTraffic™ is not the proper tool to measure this scenario, TransModeler™ was used to calculate the 95th percentile queue lengths at the Franconia Road and Commerce Street/Loisdale Road intersection to ensure the effect of the merge would not cause a queue on Franconia Road westbound or Loisdale Road northbound. Based on the TransModeler™ simulation result (plus or minus a two percent error), the 95th percentile queues would not extend back to the previous intersection. The Loisdale Road northbound approach to Franconia Road would result in a 95th percentile queue length of 585 feet (out of a total of 775 feet of queue space for the left-turn lanes). The Franconia Road westbound approach to Commerce Street would result in a 95th percentile queue length of 761 feet (out of a total of 1,200 total feet of queue space for the through lanes). **Table 6-9** contains the 95th percentile queue summary for the two approaches.

Table 6-9: 95th Percentile Queue for Loisdale Road Northbound Approach to Franconia Road and Franconia Road Westbound Approach to Commerce Street

Lane Group	95th Percentile Queue Length (Feet)	Pass/Fail
Loisdale Road Northbound Approach to Franconia Road Eastbound		
Lane One – Left-turn lane	186	Pass
Lane Two – Left-turn lane	585	Pass
Lane Three – Left-turn lane	549	Pass
Lane Five – Through lane	212	Pass
Lane Six – Through lane	290	Pass
Lane Seven – Right-turn lane	124	Pass
Franconia Road Westbound Approach to Commerce Street Southbound		
Lane One – Left-turn lane	160	Pass
Lane Two – Through lane	422	Pass
Lane Three – Through lane	761	Pass
Lane Four – Through lane	413	Pass
Lane Five – Right-turn lane	No Queue – Free flow	Pass

6.6.5.2 Complete Intersection Queuing Analysis

The results of the No-build Condition compared to the Build with Mitigation Condition queuing analysis for both signalized and unsignalized intersections are presented in **table 6-10**. Note that the percentile values are expressed in feet and a car occupies about 25 linear feet of roadway, including the space between cars.

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
1	Loisdale Road/Commerce Street & Franconia Road (Westbound) (Signalized)										
	WB (Franconia Rd)	L	590	121	169	177	232	136	187	162	269
	WB (Franconia Rd)	T	1,100	305	331	261	288	310	365	455	492
	WB (Franconia Rd)	R	605	126	-	39	-	135	181	0	282
	NB (Commerce St)	L	69	2	12	12	42	2	18	12	44
	NB (Commerce St)	T	69	12	21	8	29	11	16	8	33
	SB (Commerce St)	T	722	108	150	273	306	115	159	275	424
	SB (Commerce St)	R	400	2	189	89	365	2	200	89	#456
2	Loisdale Road/Commerce Street & Franconia Road (Eastbound) (Signalized)										
	EB (Franconia Rd)	L	300	110	156	72	127	110	168	72	116
	EB (Franconia Rd)	T	464	158	209	194	224	216	257	199	217
	EB (Franconia Rd)	R	350	0	71	0	136	0	77	0	143
	NB (Loisdale Rd)	T	1,138	199	187	313	506	206	195	335	900
	NB (Loisdale Rd)	R	550	0	133	0	158	0	140	0	176
	SB (Loisdale Rd)	L	69	6	29	0	21	6	24	0	28
	SB (Loisdale Rd)	T	69	6	26	0	40	5	26	0	41
3	Loisdale Road & Loisdale Court/Mall Access (Signalized)										
	EB (Loisdale Court)	L	200	40	63	160	#214	40	40	160	#265
	EB (Loisdale Court)	LT	846	41	95	160	308	41	112	160	447
	EB (Loisdale Court)	R	75	0	61	12	#129	0	63	12	#131
	WB (Mall Access)	L	147	9	30	80	122	9	32	80	130
	WB (Mall Access)	T	147	10	38	23	107	10	37	23	102
	WB (Mall Access)	R	30	0	#64	0	#60	0	#62	0	#59
	NB (Loisdale Rd)	L	225	11	70	19	123	11	86	22	97
	NB (Loisdale Rd)	T	732	57	84	156	185	78	98	155	196
	NB (Loisdale Rd)	R	400	0	-	0	9	0	-	0	7
	SB (Loisdale Rd)	L	600	6	46	58	129	6	48	58	136
	SB (Loisdale Rd)	T	1,455	56	81	218	1020	105	136	220	910
	SB (Loisdale Rd)	R	140	0	34	4	112	0	70	4	#162

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
4	Loisdale Road & Ramp from NB I-95/Spring Mall Drive (Signalized)										
	EB (Ramp from NB I-95)	L	425	120	167	101	143	119	183	101	158
	EB (Ramp from NB I-95)	T	823	136	173	105	155	135	171	105	147
	EB (Ramp from NB I-95)	R	325	0	53	0	22	18	127	0	31
	WB (Spring Mall Dr)	L	1,299	12	72	91	142	7	59	90	149
	WB (Spring Mall Dr)	R	2,398	85	133	63	171	0	5	0	189
	NB (Loisdale Rd)	TR	527	124	169	147	198	126	179	207	230
	NB (Loisdale Rd)	R	275	0	44	0	71	0	51	0	81
	SB (Loisdale Rd)	L	609	8	48	31	181	4	56	31	224
	SB (Loisdale Rd)	T	732	25	110	54	178	24	207	54	164
5	Loisdale Road & Metropolitan Center Drive (Met Center Dr) (Signalized)										
	WB (Met Center Dr)	L	587	13	28	19	45	13	30	19	48
	WB (Met Center Dr)	R	587	0	52	0	39	0	54	0	41
	NB (Loisdale Rd)	T	598	50	89	38	62	52	95	43	67
	NB (Loisdale Rd)	R	170	0	16	0	15	0	9	0	9
	SB (Loisdale Rd)	L	270	1	48	0	78	1	47	0	85
	SB (Loisdale Rd)	T	527	4	119	0	64	12	221	0	59
6	Loisdale Road & Northern Entrance Road to GSA Facility (Access to Building A, 66808 & 6610 Loisdale Road) (TWSC)										
	WB (N Ent Rd to GSA)	L	-	-	4	-	11	-	-	-	-
	WB (N Ent Rd to GSA)	R	-	-	-	-	-	-	-	-	-
	NB (Loisdale Rd)	TR	-	-	0	-	-	-	-	-	-
	SB (Loisdale Rd)	L	594	-	40	-	-	-	57	-	-
	SB (Loisdale Rd)	T	598	-	-	-	-	-	-	-	61
7	Loisdale Road & Southern Entrance Road to GSA Facility (Access to Building B, 7000 Loisdale Road) (TWSC) ^a										
	WB (S Ent Rd to GSA)	L	-	-	27	-	45	-	-	-	-
	WB (S Ent Rd to GSA)	R	-	-	50	-	53	-	-	-	-
	NB (Loisdale Rd)	TR	-	-	8	-	-	-	-	-	-
	SB (Loisdale Rd)	L	-	-	73	-	14	-	-	-	-
	SB (Loisdale Rd)	T	-	-	-	-	39	-	-	-	-
8	Loisdale Road & Frontier Drive Extension (Signalized)										
	WB (Frontier Dr Ext)	L	519	18	48	164	236	13	47	178	213
	WB (Frontier Dr Ext)	R/LR	519	0	18	0	43	-	94	-	251
	NB (Loisdale Rd)	T	2,409	201	261	159	219	227	306	163	213
	NB (Loisdale Rd)	R	300	29	#137	2	90	34	204	0	59
	SB (Loisdale Rd)	L	325	9	70	10	74	62	261	8	102
	SB (Loisdale Rd)	T	559	53	99	451	472	43	145	442	502

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
9	Loisdale Road & Lois Drive (TWSC)										
	WB (Lois Drive Dr)	LR	696	-	51	-	37	-	54	-	38
	NB (Loisdale Rd)	TR	1,594	-	6	-	13	-	14	-	11
	SB (Loisdale Rd)	L	2,409	-	19	-	25	-	24	-	26
	SB (Loisdale Rd)	T	2,409	-	9	-	12	-	5	-	14
10	Loisdale Road & Hotel Entrance/Newington Road (Signalized)										
	EB (Hotel Entrance)	LTR	422	7	50	5	67	7	57	5	66
	WB (Newington Rd)	LT	664	115	236	238	412	115	214	238	373
	WB (Newington Rd)	R	250	0	145	0	#203	0	96	0	205
	NB (Loisdale Rd)	L	200	2	13	23	63	2	11	23	74
	NB (Loisdale Rd)	T	573	63	112	43	64	71	115	44	76
	NB (Loisdale Rd)	R	365	3	94	0	59	5	104	0	63
	SB (Loisdale Rd)	L	500	29	103	123	180	29	98	123	202
	SB (Loisdale Rd)	T	566	21	53	208	244	21	55	268	398
	SB (Loisdale Rd)	R	450	0	7	0	20	0	6	0	80
11	Loisdale Road/I-95 (N) Ramp C & D & Fairfax County Parkway (Signalized)										
	EB (I-95 NB Off-Ramp)	T	409	198	304	51	105	198	344	51	99
	EB (I-95 NB Off-Ramp)	R	596	-	-	-	-	0	59	0	-
	WB (Loisdale Rd)	L	469	93	153	234	241	94	157	254	247
	WB (Loisdale Rd)	R	499	146	164	432	472	173	168	518	487
	NB (Fairfax County Pkwy)	T	686	453	427	860	626	453	442	889	#660
	NB (Fairfax County Pkwy)	R	350	75	259	21	274	95	280	20	283
	SB (Fairfax County Pkwy)	L	450	256	359	154	239	255	382	155	244
	SB (Fairfax County Pkwy)	T	628	1328	#684	535	400	1328	#660	570	379
	SB (Fairfax County Pkwy)	R	615	0	476	0	-	0	341	0	-
12	Frontier Drive & Franconia Road (Westbound) (Signalized)										
	WB (Franconia Rd)	L	450	102	138	127	171	101	138	114	173
	WB (Franconia Rd)	T	774	406	363	284	233	425	343	284	258
	WB (Franconia Rd)	TR	580	406	499	284	349	425	384	284	310
	NB (Frontier Dr)	L	74	84	52	44	40	81	57	79	57
	NB (Frontier Dr)	T	74	3	17	4	20	3	14	2	12
	SB (Frontier Dr)	T	441	72	115	57	91	68	107	56	97
	SB (Frontier Dr)	TR	240	72	111	57	117	68	122	56	115

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
13	Frontier Drive & Franconia Road (Eastbound) (Signalized)										
	EB (Franconia Rd)	L	1,067	22	55	62	118	20	57	66	126
	EB (Franconia Rd)	T	1,067	118	173	219	248	108	140	307	363
	EB (Franconia Rd)	R	800	141	-	95	-	294	41	0	28
	NB (Frontier Dr)	T	854	336	822	322	556	323	353	383	461
	NB (Frontier Dr)	R	480	0	169	184	169	0	131	0	225
	SB (Frontier Dr)	LT	74	7	28	8	31	10	30	5	24
	SB (Frontier Dr)	T	74	-	-	-	-	10	28	5	42
14	Frontier Drive & Best Buy/Springfield Mall Lot Entrance (Springfield Mall Lot Ent) (Signalized)										
	EB (Springfield Mall Lot Ent)	L	199	13	26	143	132	13	33	143	147
	EB (Springfield Mall Lot Ent)	LTR	199	8	58	63	#238	8	51	67	#222
	WB (Best Buy Ent)	L	207	~61	110	104	164	~61	99	104	158
	WB (Best Buy Ent)	TR	207	4	47	14	119	4	43	14	130
	NB (Frontier Dr)	L	190	36	88	135	#212	34	83	142	#202
	NB (Frontier Dr)	T	562	463	220	98	170	463	154	97	200
	NB (Frontier Dr)	R	500	2	26	0	40	3	27	0	33
	SB (Frontier Dr)	L	240	53	101	93	182	53	107	126	183
	SB (Frontier Dr)	T	939	204	113	158	192	271	167	136	229
	SB (Frontier Dr)	R	300	0	28	62	63	0	30	0	90
15	Frontier Drive & Home Depot/Springfield Mall Garage Entrance (Springfield Mall Gar Ent) (Signalized)										
	EB (Springfield Mall Gar Ent)	LT	166	2	15	20	56	2	18	20	61
	EB (Springfield Mall Gar Ent)	R	100	0	-	0	18	0	-	0	14
	WB (Home Depot Ent)	LTR	256	~89	182	53	269	~89	192	53	#289
	NB (Frontier Dr)	L	190	8	26	20	55	7	27	21	60
	NB (Frontier Dr)	T	469	155	151	69	117	134	161	66	133
	NB (Frontier Dr)	R	300	1	30	0	25	1	32	0	29
	SB (Frontier Dr)	L	310	114	163	176	239	113	162	173	247
	SB (Frontier Dr)	T	562	35	57	83	110	43	76	81	119
	SB (Frontier Dr)	R	-	0	-	0	-	0	-	0	-

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
16	Frontier Drive & Spring Mall Drive (Signalized)										
	EB (Spring Mall Dr)	L	215	47	70	81	76	48	80	82	85
	EB (Spring Mall Dr)	LT	2,398	48	114	84	164	49	123	85	166
	EB (Spring Mall Dr)	R	1,341	0	282	190	488	0	245	184	488
	WB (Spring Mall Dr)	LT	218	23	45	148	205	23	44	148	204
	WB (Spring Mall Dr)	R	218	0	35	0	105	0	34	0	101
	NB (Frontier Dr)	L	325	193	198	238	268	179	214	220	312
	NB (Frontier Dr)	T	717	235	261	311	431	235	339	465	634
	NB (Frontier Dr)	R	275	0	42	9	104	0	98	11	243
	SB (Frontier Dr)	L	200	19	50	29	81	20	52	33	90
	SB (Frontier Dr)	T	469	49	236	147	247	56	234	142	267
	SB (Frontier Dr)	R	225	0	93	6	198	1	104	6	188
17	Frontier Drive & Franconia-Springfield Parkway (Westbound) (Signalized)										
	WB (F-S Pkwy WB Off-ramp)	L	460	34	66	35	90	57	89	33	92
	WB (F-S Pkwy WB Off-ramp)	LT	792	34	88	34	71	57	120	34	250
	WB (F-S Pkwy WB Off-ramp)	R	450	0	33	0	207	0	59	0	320
	NB (Frontier Dr)	L	262	0	-	1	8	1	12	29	58
	NB (Frontier Dr)	T	262	14	47	22	42	14	71	76	76
	SB (Frontier Dr)	T	622	269	#738	155	231	229	605	162	195
	SB (Frontier Dr)	R	375	59	325	218	318	40	309	217	247
18	Frontier Drive & Franconia-Springfield Parkway (Eastbound) (Signalized)										
	EB (F-S Pkwy EB Off-ramp)	L	430	168	#1264	196	222	223	231	166	185
	EB (F-S Pkwy EB Off-ramp)	LT	948	169	#969	198	194	224	337	169	208
	EB (F-S Pkwy EB Off-ramp)	R	694	~607	#455	0	96	377	366	0	67
	NB (Frontier Dr)	T	320	17	52	101	139	22	41	315	210
	NB (Frontier Dr)	R	175	0	20	0	#128	0	20	0	#188
	SB (Frontier Dr)	L	262	3	30	15	31	161	185	365	#311
	SB (Frontier Dr)	T	262	65	81	4	22	535	#305	232	241

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
19	Franconia-Springfield Parkway & Spring Village Drive/Bonniemill Lane (Signalized)										
	EB (F-S Pkwy)	L	520	74	302	38	77	74	272	38	79
	EB (F-S Pkwy)	T	1,075	~2874	#1320	306	266	~3286	#1449	308	274
	EB (F-S Pkwy)	R	395	0	118	0	10	0	113	0	11
	WB (F-S Pkwy)	L	415	108	150	203	241	108	174	203	260
	WB (F-S Pkwy)	T	2,515	183	143	1097	409	185	162	1231	466
	WB (F-S Pkwy)	R	410	0	39	6	101	0	35	7	145
	NB (Bonniemill Ln)	L	160	37	46	13	33	37	50	13	34
	NB (Bonniemill Ln)	T	160	6	17	3	12	6	18	3	12
	NB (Bonniemill Ln)	R	160	296	#178	0	50	296	#182	0	51
	SB (Spring Village Dr)	L	250	220	248	185	220	220	233	185	228
	SB (Spring Village Dr)	T	830	6	93	9	49	6	83	9	69
	SB (Spring Village Dr)	R	250	0	37	0	129	0	35	0	127
20	Franconia-Springfield Parkway (F-S Pkwy) & I-95 HOT Lane Ramps (Signalized)										
	EB (F-S Pkwy)	L (AM)	640	110	216	-	-	121	214	-	-
	EB (F-S Pkwy)	T	864	330	250	254	325	377	258	256	310
	EB (F-S Pkwy)	R (PM)	-	-	-	0	-	-	-	0	-
	WB (F-S Pkwy)	L (PM)	425	-	-	84	129	-	-	84	121
	WB (F-S Pkwy)	T	1,039	193	233	208	254	203	248	231	270
	WB (F-S Pkwy)	R (AM)	600	0	-	-	-	0	28	-	-
	NB (I-95 HOT Lane Off-ramp)	(AM)	936	67	233	-	-	75	234	-	-
	SB (I-95 HOT Lane Off-ramp)	(PM)	1,071	-	-	0	249	-	-	0	256
	SB (I-95 HOT Lane Off-ramp)	R (PM)	1,071	-	-	0	216	-	-	0	226
21	Franconia-Springfield Parkway (F-S Pkwy)/Manchester Boulevard & Beulah Street (Signalized)										
	EB (F-S Pkwy)	L	610	320	342	261	338	320	331	261	395
	EB (F-S Pkwy)	T	1,764	390	349	912	675	390	330	949	753
	EB (F-S Pkwy)	R	1,764	51	172	470	484	51	168	483	406
	WB (Manchester Blvd)	L	375	91	#430	182	#487	91	206	182	347
	WB (Manchester Blvd)	T	813	~695	734	825	#842	414	362	487	437
	WB (Manchester Blvd)	R	200	0	327	0	528	0	159	25	#208
	NB (Beulah St)	L	500	~574	#532	~542	#565	~574	#533	~542	#560
	NB (Beulah St)	T	1,016	358	#1198	294	#1354	358	#1230	294	#1333
	NB (Beulah St)	R	315	0	197	0	189	0	174	0	177
	SB (Beulah St)	L	380	65	134	217	#404	65	120	217	#404
	SB (Beulah St)	T	928	~219	333	~466	#755	~219	333	~466	#733
	SB (Beulah St)	R	235	66	#238	97	#374	66	229	97	#368

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
22	Franconia Road & Beulah Street (Signalized)										
	EB (Franconia Rd)	L	190	2	43	3	66	2	15	6	15
	EB (Franconia Rd)	TR	6,354	264	238	~460	391	256	238	439	431
	WB (Franconia Rd)	L	350	573	#426	~761	#427	570	#438	~735	#417
	WB (Franconia Rd)	TR	965	114	386	197	689	116	378	173	652
	NB (Beulah St)	LT	659	114	167	207	265	114	192	218	327
	NB (Beulah St)	R	659	490	405	257	255	490	461	208	207
	SB (Driveway)	LTR	249	6	28	40	89	6	28	40	87
23	I-95 NB On-ramp & Commerce Street (Signalized) ^b										
	EB (Commerce St)	L	515	-	-	1	67	-	-	1	74
	EB (Commerce St)	T	-	-	-	0	-	-	-	0	-
	WB (Commerce St)	T	364	-	-	48	109	-	-	50	107
	WB (Commerce St)	R	364	-	-	0	88	-	-	0	120
24	Frontier Drive Extension (F Dr Ext) & Metro Station (Signalized)										
	WB (Metro Station)	L	400	2	20	46	104	3	18	81	162
	NB (F Dr Ext)	T	389	17	69	60	113	23	74	293	308
	NB (F Dr Ext)	R	200	51	124	0	19	57	169	0	67
	SB (F Dr Ext) to Driveway	L	300	238	177	86	189	275	178	155	220
	SB (F Dr Ext)	L	300	98	135	40	120	114	152	73	163
	SB (Frontier Dr Ext)	T	-	0	-	0	-	0	-	0	-
25	Frontier Drive Extension & Metropolitan Center Drive Extension (Met Center Dr Ext) ^c										
	EB (Met Center Dr Ext)	L	53	-	-	-	-	-	17	-	#56
	EB (Met Center Dr Ext)	LR	53	-	56	-	#82	-	26	-	#80
	NB (Frontier Dr Ext)	LT	887	-	47	-	17	-	32	-	60
	NB (Frontier Dr Ext)	T	887	-	-	-	8	-	30	-	53
	SB (Frontier Dr Ext)	TR/T	389	-	12	-	2	-	19	-	17
	SB (Frontier Dr Ext)	R	175	-	-	-	-	-	20	-	11

Table 6-10: Comparison of No-build and Build with Mitigation Condition Queuing Analysis (continued)

#	Intersection & Approach	Lane Group	Turning Bay/Link Length (feet)	No-build Condition				Build with Mitigation Condition			
				AM Peak		PM Peak		AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
26	Frontier Drive Extension & Site South Access (TWSC)										
	EB (Frontier Dr Ext)	L	275	-	-	-	-	-	97	-	27

Notes:

~ 50th percentile volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal. Due to upstream metering, the 95th percentile queue may be less than the 50th percentile queue.

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left / through / right lanes

LTR/LTR = No-Build/Build with Mitigation

TWSC = Two-way STOP-Controlled unsignalized intersection

Red cells denote approaches and lane groups whose queuing length exceeds capacity.

^a Intersection #7 would be removed for the Build with Mitigation Condition.

^b Intersection not analyzed during the AM peak hour.

^c Intersection would operate as a TWSC intersection under the No-build Condition and a roundabout under the Build with Mitigation Condition.

6.6.6 Recommended Traffic Mitigation

Recommended traffic mitigation measures were developed to address the substantial traffic impacts caused by the addition of the Consolidated FBI HQ in Springfield. These included traffic signal optimization, road widening, lane geometry improvements at intersections, constructing new pedestrian bridges, and changing roadway designs to construct a roundabout instead of an unsignalized intersection. If implemented, the recommended traffic mitigation measures would maintain acceptable traffic flow conditions based on the Springfield Site Transportation Agreement. The following recommendations in [table 6-11](#) are made to mitigate the proposed traffic impacts of the Springfield Build Condition:

Table 6-11: Recommended Traffic Mitigation

Impact	Mitigation
<p>To improve traffic operations along the Loisdale Road and Frontier Drive corridors the traffic signals would be optimized and/or coordinated</p>	<p>Optimize the traffic signals at the following locations:</p> <ul style="list-style-type: none"> ○ Franconia Road (VA 644) Westbound and Commerce Street intersection ○ Loisdale Road and Loisdale Court intersection ○ Loisdale Road and Metropolitan Center Drive intersection ○ Franconia Road (VA 644) Westbound and Frontier Drive intersection ○ Frontier Drive and North Mall Entrance intersection ○ Frontier Drive and Mall South Entrance intersection ○ Frontier Drive and Spring Mall Drive intersection ○ Frontier Drive and Franconia-Springfield Parkway (VA 289) westbound on/off ramps intersection ○ Franconia Road (VA 644) and Beulah Street intersection
<p>To improve traffic operations at isolated intersections change the intersection geometry including new turn lanes (optimize traffic signal if warranted)</p>	<p>Change the intersection geometry including new turn lanes at the following locations:</p> <ul style="list-style-type: none"> ○ Franconia Road (VA 644) Eastbound and Loisdale Drive intersection ○ Loisdale Road and I-95 Northbound off-ramp/Spring Mall Drive intersection ○ Loisdale Road and Frontier Drive Extension intersection ○ Loisdale Road and Newington Road intersection ○ Loisdale Road and Fairfax County Parkway (VA 286) intersection ○ Franconia Road (VA 644) Eastbound and Frontier Drive intersection ○ Frontier Drive and Franconia-Springfield Parkway (VA 289) eastbound on/off ramps intersection ○ Frontier Drive Extension and Metro Station Access Drive intersection ○ Frontier Drive Extension and Site South Access intersection ○ Franconia-Springfield Parkway (VA 289) and Beulah Street intersection
<p>To improve traffic operations construct a roundabout</p>	<p>Construct a new roundabout at Frontier Drive Extension and Metropolitan Center Drive Extension intersection</p>
<p>To improve traffic operations construct a pedestrian bridge to remove the pedestrian crossing times form the traffic signal</p>	<p>Construct a new pedestrian bridge network and remove the pedestrian crossing times from the traffic signals at the following locations:</p> <ul style="list-style-type: none"> ○ Franconia Road (VA 644) Westbound and Frontier Drive intersection ○ Franconia Road (VA 644) Eastbound and Frontier Drive intersection

The mitigation measures were developed to ensure the intersections would operate in a safe manner for all modes. This included assigning adequate pedestrian crossing times for any signalized intersection that required a change in the number of approach lanes and recommending non-motorized bridges to ensure bicycle and pedestrians can safely cross when an at grade crossing would not be safely accommodated. It is assumed that all

planned roadway improvements and mitigation would follow the American Association of State Highway Transportation Officials, VDOT, and FCDOT requirements to ensure all vehicle, bicycle, and pedestrian movements are designed to the latest safety standards.

Overall, the study area would no longer experience corridor-level impacts along Frontier Drive or Loisdale Road resulting in changing the Build Condition impacts from direct, long-term, major adverse to no measurable direct, long-term impacts under the Build with Mitigation Condition. Isolated intersection improvements aimed at addressing the Build Condition impacts specifically along Loisdale Road, Frontier Drive, and the Frontier Drive Extension would be addressed under the Build with Mitigation Condition. This would result in changing the impacts from direct, long-term, adverse impacts to direct, long-term, beneficial impacts, since the operations would improve to a better operation than the No-build Condition. There would be no failing Interstate facilities under the Build Condition and Build with Mitigation Condition; therefore, there would be no measurable direct, long-term impacts to the Interstate system (see [Section 6.6.7.3](#)).

The construction impacts would change from direct, short-term, adverse impacts under the Build Condition during construction to direct, short-term, major adverse impacts under the Build with Mitigation Condition during construction. This change reflects the short-term impacts from adding roadway construction related trips caused by trucks, employees, and equipment as well as intermittent lane or road closures at locations where the roadway improvements would occur.

6.6.7 Freeway Analysis Summary

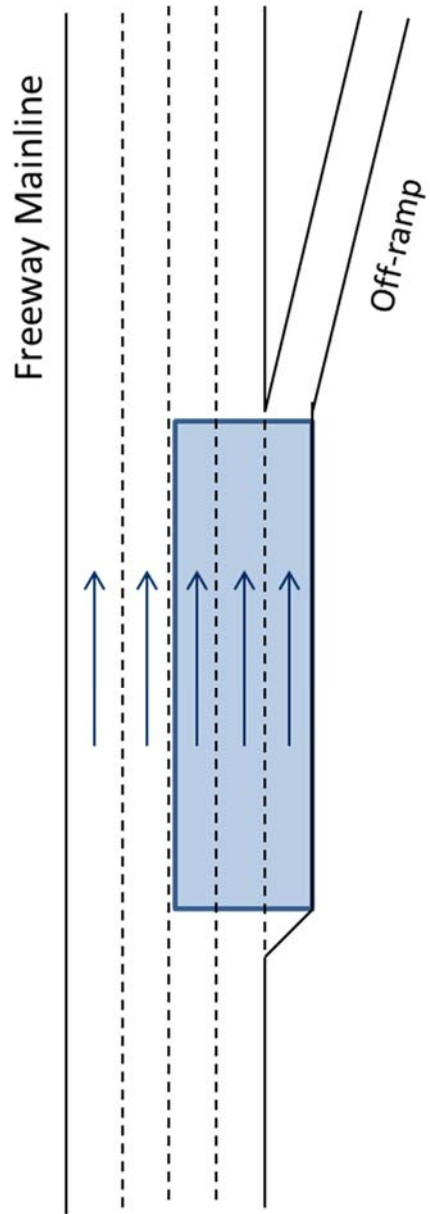
The Highway Capacity Software (HCS) Version 6.65 was used to determine the Interstate operations for these key on- and off-ramps. The HCS modules follow the HCM uninterrupted flow procedures called freeways. The Interstate system is a network of signed roadways that crisscross the country from coast to coast (east-west) and border to border (north-south) and operate as freeways or uninterrupted vehicle flow. Interrupted vehicle flow refers to the roadways with traffic signals, stop signs, and roundabouts.

Based on the proposed FBI trip distribution, 70 percent of forecasted FBI vehicle trips would use the Interstate system (I-95/I-495, I-395, or I-495) to access the proposed site. Reflecting the importance of the Interstate system serving the Springfield site, all three Interstates were evaluated to determine whether or not the added vehicle trips would cause any failing interstate facilities. Based on the agreed Springfield Site Transportation Agreement, the evaluated Interstate facilities focused on the peak direction only and at the primary off-ramps serving the inbound forecasted FBI vehicle trips during the AM peak hour and the on-ramps serving the outbound forecasted FBI vehicle trips during the PM peak hour.

6.6.7.1 *Freeway Facilities Types Studied*

Several freeway facility types were evaluated including diverge, merge, weave, and complex ramp designs including more than one facility type. In total, the analysis included the evaluation of one diverge (off-ramp), three merges (on-ramp), two weaves, and two complex ramp designs composed of diverge, ramp, and merge areas. Diverge facilities represent an off-ramp from the freeway. Merge facilities represent an on-ramp to the freeway. Weave facilities represent an on-ramp followed by an off-ramp that share the same lane and are spaced close enough to create a crisscross vehicle pattern caused by vehicles entering the freeway potentially blocking vehicles exiting the freeway or vice versa. The vehicle volumes combined with the distance between the on- and off-ramps help determine if a facility qualifies as a weave or two separate merge and diverge areas (HCM, Equation 12-4; TRB 2010). [Figures 6-12 and 6-13](#) illustrate a typical diverge and merge facility, respectfully. [Figure 6-14](#) illustrates a typical weave facility.

Figure 6-12: Typical Diverge Facility



Legend

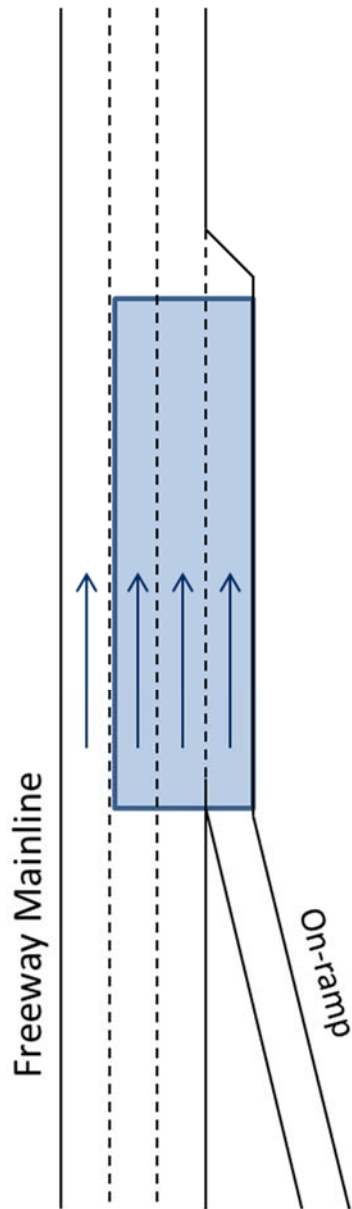
Analyzed Area



Direction of Travel



Figure 6-13: Typical Merge Facility



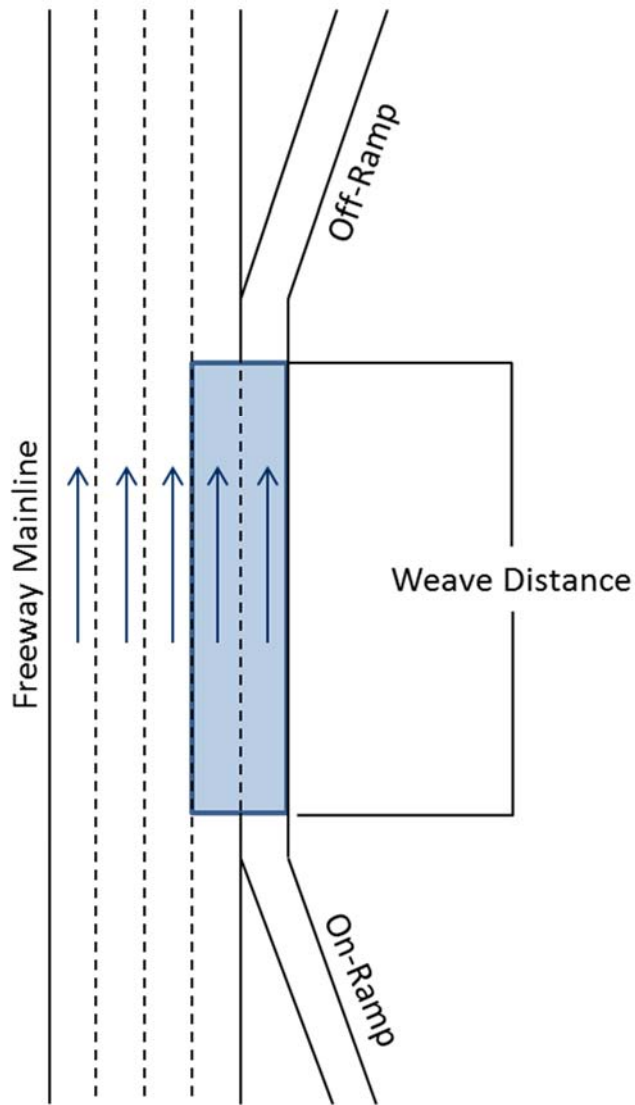
Legend

Analyzed Area



Direction of Travel

Figure 6-14: Typical Weave Facility



Legend

Analyzed Area



Direction of Travel



Freeway facilities are evaluated based on the density of vehicles. The higher the density, the slower the vehicles travel and the worse the operations. Based on the vehicle density, the HCM provides LOS equivalents to represent the driver's perception of the facility operation. [Table 6-12](#) contains the HCM freeway LOS.

Table 6-12: HCM Weaving Segments, Merge, and Diverge Facilities Level of Service

LOS	Density (passenger cars/mile/lane)	Description
A	Less than or equal to 10	Passing operation
B	>10-20	
C	>20-28	
D	>28-35	
E	>35	Unstable conditions
F	Demand Exceeds Capacity	Above capacity and unstable conditions

Source: TRB (2010)

All Interstate facilities were evaluated based on a PHF of 0.92 (ratio of the 60-minute volume divided by 4 times the highest 15-minute volume), the lowest accepted by VDOT’s Traffic Impact Analysis Regulations (VDOT 2012b) to be consistent for all three sites and a conservative value for the analysis of future facilities. This PHF is also the same PHF used to evaluate all intersection facilities within the study area.

6.6.7.2 Freeway Facilities Evaluated

The following facilities were evaluated:

AM Peak Hour Inbound Flows

- Ramp Diverge: I-95 northbound to Loisdale Road/Spring Mall Drive
- Complex Section: I-95/I-495/I-395/I-495 to Franconia Road (VA 644) eastbound

PM Peak Hour Inbound Flows

- Weave Section: Fairfax County Parkway between I-95 northbound off-ramp and I-95 southbound on-ramp/Backlick Road northbound
- Weave Section: I-95 southbound between Fairfax County Parkway on-ramp and Fairfax County Parkway off-ramp
- Complex Section: Franconia Road westbound to I-95/I-495/I-395/I-495
 - Ramp Merge: Franconia Road (VA 644) westbound ramp to I-95 NB/I-495 EB
 - Ramp Merge: Franconia Road (VA 644) westbound ramp to I-395 NB
 - Ramp Merge: Franconia Road (VA 644) westbound ramp to I-495 NB

I-95 Northbound to Loisdale Road/Spring Mall Drive

This facility is a five-lane facility with four through lanes and one lane serving the off-ramp. There is a 370-foot deceleration lane serving the off-ramp.

I-95/I-495/I-395/I-495 to Franconia Road (VA 644) Eastbound

This facility is composed of three parts: part one is a four-lane facility with two through lanes and two-lanes serving the off-ramp to Franconia Road westbound, part two is a one-lane ramp facility, and part three is a three-lane facility with two through lanes serving Franconia Road eastbound and one-lane serving the on-ramp from I-95/I-495/I-395/I-495.

Fairfax County Parkway between I-95 Northbound off-ramp and I-95 Southbound on-ramp/Backlick Road Northbound

This facility is a three-lane facility along the Fairfax County Parkway mainline with two through lanes and one lane serving the on- and off- ramps. There is a 340-foot distance between the on- and off- ramps and two maneuvering lanes (minimum number of lanes in use to either enter or exit Fairfax County Parkway).

I-95 Southbound between Fairfax County Parkway on-ramp and Fairfax County Parkway off-ramp

This facility is a five-lane facility along the freeway mainline with four through lanes and one lane serving the on- and off-ramps. There is an 800-foot distance between the on- and off-ramps and two maneuvering lanes (the minimum number of lanes in use to either enter or exit the freeway).

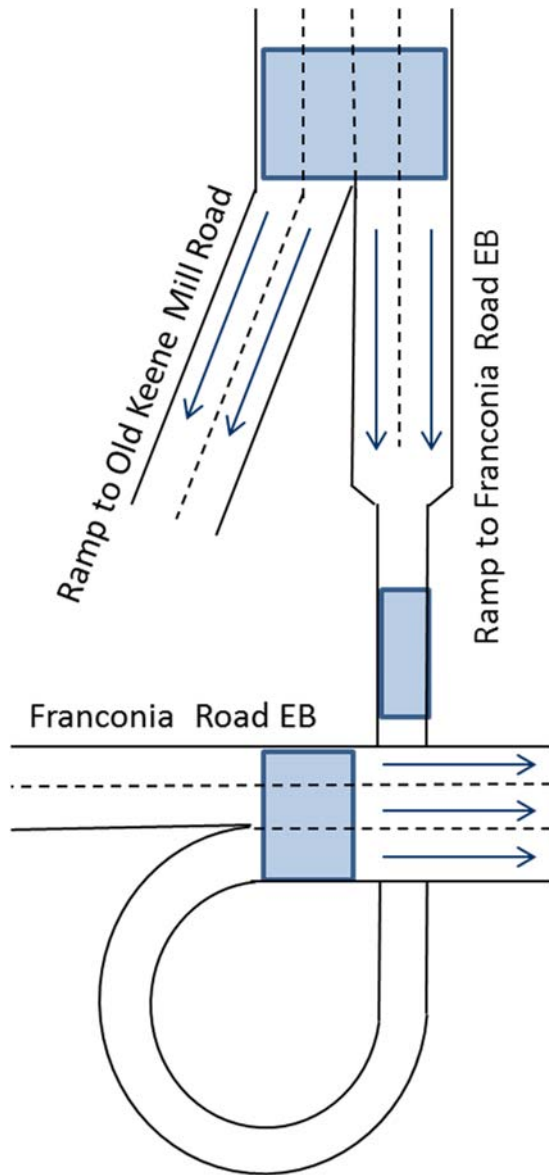
Franconia Road Westbound to I-95/I-495/I-395/I-495

This facility is composed of three parts: part one is a three-lane facility with one through lane and two lanes serving the off-ramp to the Interstates, part two is a one-lane ramp facility, and part three is three merge facilities described below:

- I-95 NB/I-495 EB merge is a four-lane facility with three through lanes serving the freeway mainline, one lane serving the on-ramp from I-395 with a 4,000-foot acceleration lane, and one lane serving the on-ramp from Franconia Road with a 675-foot acceleration lane ***(It was agreed by VDOT that this merge facility would be analyzed as a four-lane mainline and one-lane on-ramp due to the 4,000-foot length of the lane originating from I-395)***
- I-395 NB merge is a four lane facility with three through lanes serving the freeway mainline and one lane serving the on-ramp from Franconia Road with a 750-foot acceleration lane
- I-495 NB merge is a four lane facility with three through lanes serving the ramp to I-495 and one lane serving the connecting on-ramp from Franconia Road with a 700-foot acceleration lane

Because two of the facilities connecting all three Interstates to Franconia Road were composed of a set of complex merges and diverges, these facilities were evaluated by analyzing each component separately (diverge, ramp, merge). The HCM provides three tables to examine each component. If the facility capacity was lower than the table values, it was concluded that the facility would pass. **Figures 6-15, 6-16, and 6-17** illustrate the two complex facilities.

Figure 6-15: I-95/I-495/I-395/I-495 Off-ramp to Franconia Road Eastbound



Legend

Analyzed Area



Direction of Travel



Figure 6-16: Franconia Road Westbound to I-95 NB/I-495 EB/I-395 NB/I-495 NB

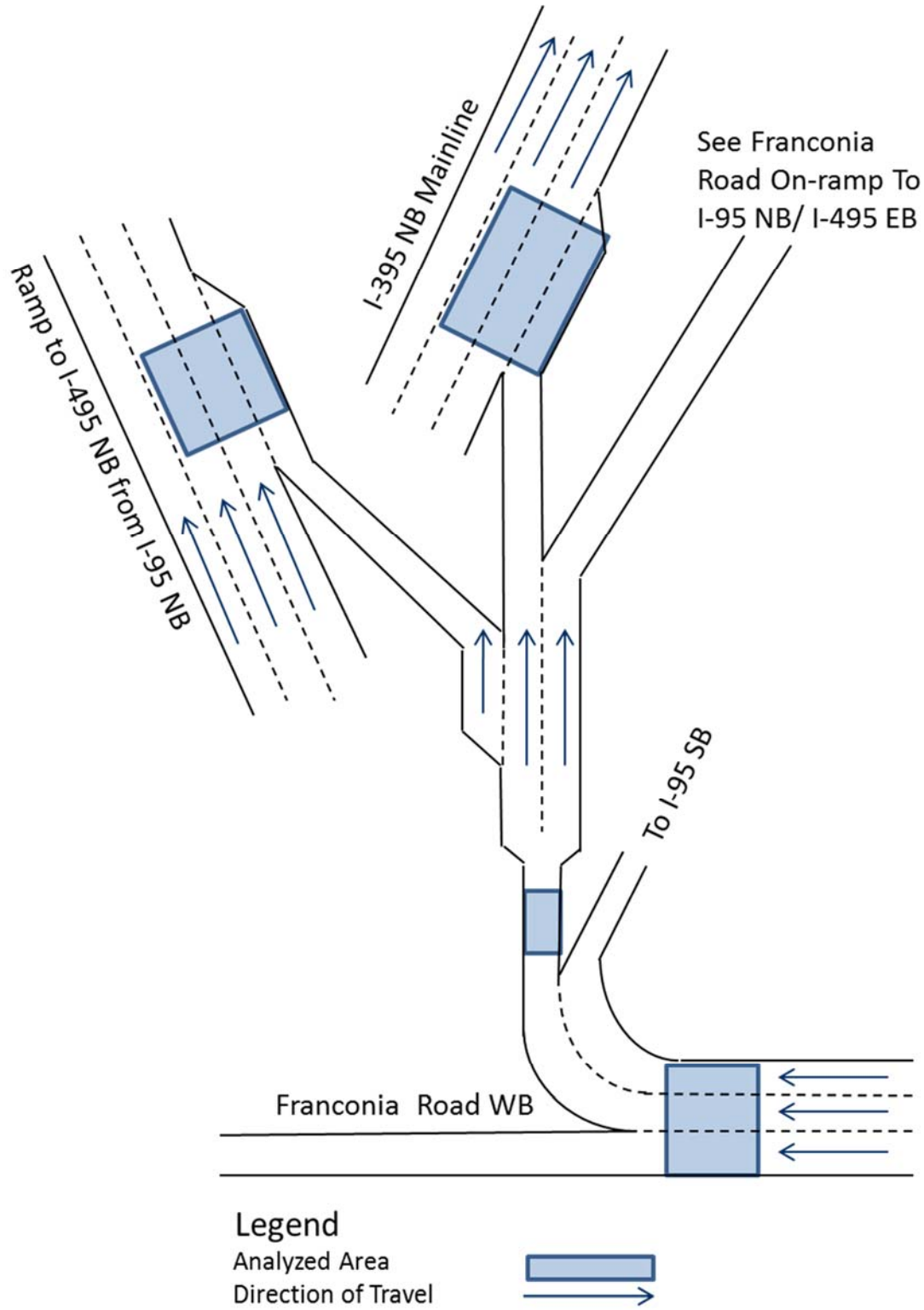
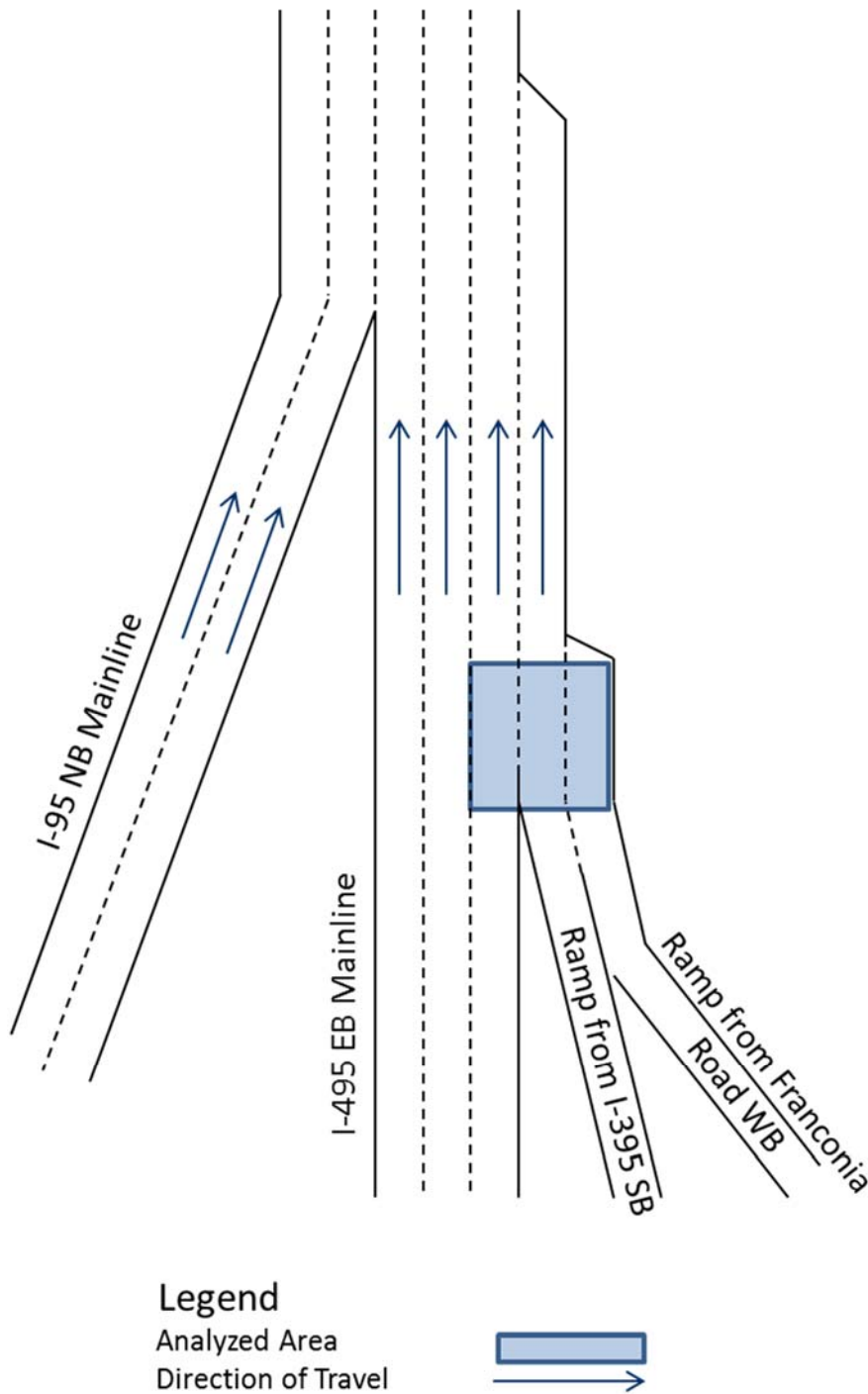


Figure 6-17: Franconia Road On-ramp to I-95 NB/I-495 EB



6.6.7.3 Freeway Analysis

Based on the analysis performed using HCS, one Interstate facility would be projected to fail during the AM peak hour. The diverge facility serving FBI vehicle trips from I-95 from the south to Loisdale Road/Spring Mall Drive

would result in a failing freeway facility (LOS E). [Table 6-13](#) contains the Build with Mitigation Condition HCS freeway analysis.

Table 6-13: Build with Mitigation Condition Freeway Analysis

Freeway Analysis	Facility Type	Density (pc/mi/ln)	LOS	Check
I-95 Northbound to Loisdale Road/Spring Mall Drive (AM only)	Diverge	37.3	E	Fail
Fairfax County Parkway between I-95 NB off-ramp and I-95 SB on-ramp/Backlick Road Northbound (PM only)	Weave	23.4	C	Pass
I-95 Southbound between Fairfax County Parkway Westbound and Fairfax County Parkway Eastbound (PM only)	Weave	27.9	C	Pass
Franconia Road Westbound to I-395 Northbound (PM only)	Merge	24.9	C	Pass
Franconia Road Westbound to I-495 Northbound (PM only)	Merge	16.5	B	Pass
Franconia Road Westbound to I-95 Northbound/I-495 Eastbound (PM only)	Merge	28.5	D	Pass

Notes: LOS = Level of Service;
 Density = Passenger cars per mile per lane (pc/mi/ln)
 Not Reported = Roadway flow rate exceeds capacity

An additional analysis was conducted on the complex set of ramps between I-95/I-495/I-395/I-495 and Franconia Road for both the inbound AM peak hour from the Interstates and outbound PM peak hour to the Interstates. Using the HCM Exhibits 13-8, 13-9, and 13-10 (TRB 2010), three parts of the complex ramp system were measured: diverge area, mainline ramp, and merge area(s). The free flow speeds were assigned the speed limit to be conservative and as agreed in the Springfield Site Transportation Agreement. A special free flow study was performed to check one ramp, since the preliminary finding was the ramp would result in a failing operation based on using the speed limit (see *Free Flow Speed Study*). [Table 6-14](#) contains the HCM freeway analysis covering the off-ramp to Franconia Road eastbound during the AM peak hour. [Table 6-15](#) contains the HCM freeway analysis covering the on-ramp from Franconia Road to the Interstate.

Table 6-14: HCM Freeway Analysis Covering Off-ramp to Franconia Road Eastbound

	Posted Speed Limit	Number of Lanes	HCM Capacity ^a	Demand Flow Rate (pc/h)	Check
Southbound Off-ramp from I-95/I-495/I-395 to Franconia Road Eastbound (AM Peak Hour)					
Upstream Freeway Segment	55	3	6,750	3,078	Pass
Upstream Diverge Influence Area	55	3	4,400	3,078	Pass
Downstream Highway Segment	35	3	5,700	2,883	Pass
Downstream Merge Influence Area	35	3	4,600	2,883	Pass
Ramp Roadway	25	1	2,000	1,971	Pass

^a Exhibits 13-8, 13-9, 13-10 (TRB 2010)

Notes: Capacity = Passenger cars per hour (pc/h)

Table 6-15: HCM Freeway Analysis Covering On-ramp from Franconia Road Westbound

	Posted Speed Limit	Number of Lanes	HCM Capacity ^a	Demand Flow Rate (pc/h)	Check
Northbound On-ramp from Franconia Road Westbound to I-95/I-495/I-395 (PM Peak Hour)					
Upstream Highway Segment	35	3	5,700	2,709	Pass
Upstream Diverge Influence Area	35	3	4,400	2,709	Pass
Downstream Freeway Segment (I-95 NB/I-495 EB)	55	4	9,000	8,004	Pass
Downstream Merge Influence Area (I-95 NB/I-495 EB)	55	4	4,600	1,657	Pass
Downstream Freeway Segment (I-395 NB)	55	3	6,750	4,504	Pass
Downstream Merge Influence Area (I-395 NB)	55	3	4,600	3,168	Pass
Downstream Freeway Segment (I-495 NB)	50	3	6,750	3,222	Pass
Downstream Merge Influence Area (I-495 NB)	50	3	4,600	1,984	Pass
Ramp Roadway	25	1	1,900	1,861	Pass

^a Exhibits 13-8, 13-9, 13-10 (TRB 2010)

Notes: Capacity = Passenger cars per hour (pc/h)

If any of the Interstate facilities failed, an addition test was agreed on based on the Springfield Site Transportation Agreement to determine if the difference in vehicle density between the No-build Condition and Build Condition was greater than five percent. This difference would confirm that the forecasted FBI vehicle trips significantly contributed to the facility failing.

Based on the additional analysis, the failing interstate facility would not contribute more than five percent to vehicle density, thus the facility is not impacted by the addition of forecasted FBI vehicle trips. [Table 6-16](#) contains the Build with Mitigation Condition additional freeway analysis.

Table 6-16: Build with Mitigation Condition Freeway Analysis

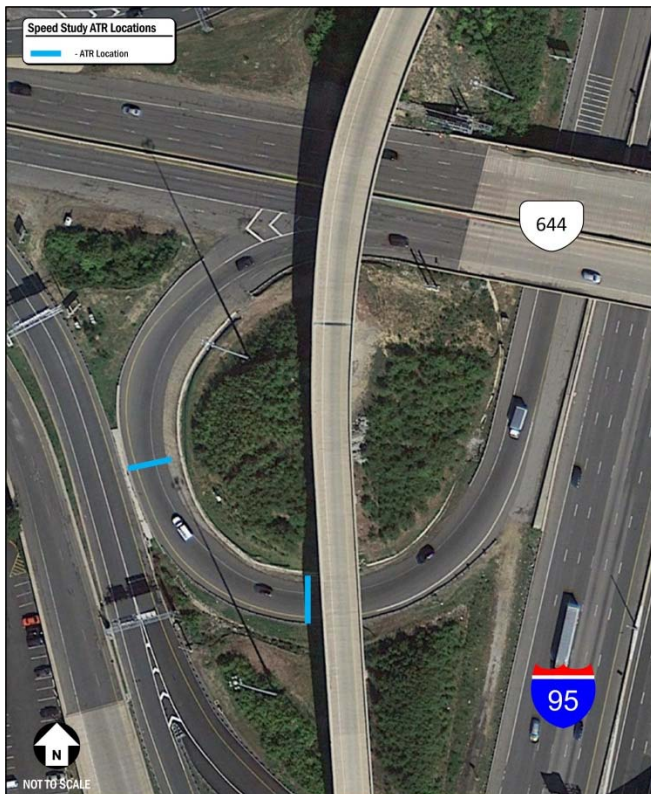
Additional Freeway Analysis	Condition	Density (pc/mi/ln)	Density Difference	AM Check
I-95 Northbound to Loisdale Road/Spring Mall Drive (AM only)	No-build	36.1	3.3%	Pass
	Build with Mitigation	37.3		

Notes: Density = Passenger cars per mile per lane (pc/mi/ln)

Free Flow Speed Study

A special free flow speed study was performed for the loop ramp from I-95/I-495/I-395/I-495 to Franconia Road eastbound, since using the posted speed limit as the free flow speed resulted in a failing ramp operation. It was necessary to verify the failing condition by obtaining field data in the analysis. Free flow speed refers to the vehicle speed that occurs during off-peak hours with minimal or no traffic to slow a vehicle. On Tuesday, May 5, 2015 through Wednesday, May 6, 2015, automatic traffic recorders (ATR) were placed on the loop ramp spread 200 feet apart to capture the speeds for each vehicle covering a 48 hour period. The ATRs were planned to collect 48 hours of data; however, a vehicle in the 43rd hour damaged the tubes and the counts stopped being recorded. The data collected still provided plenty of sample data to develop an accurate free flow speed. Figure 6-18 shows the ATR locations.

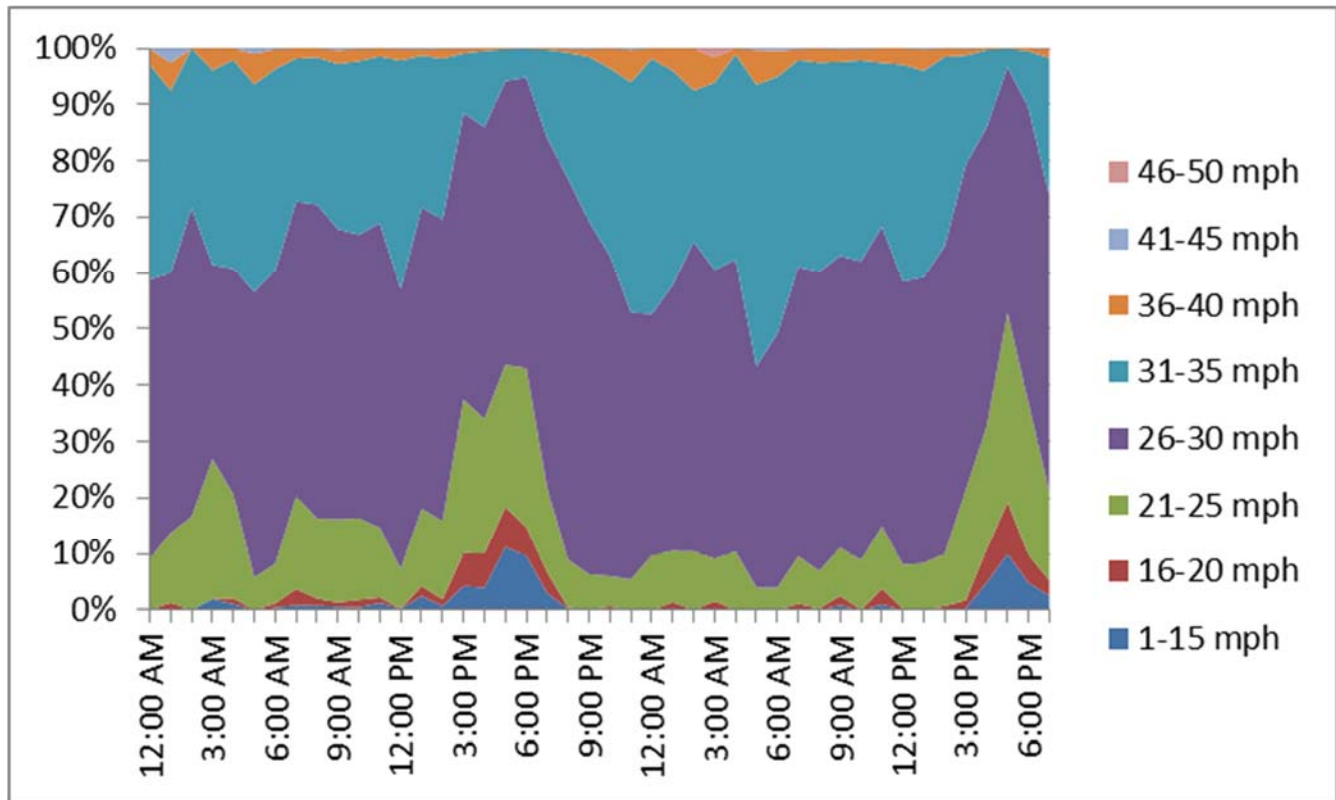
Figure 6-18: ATR Locations for Speed Study



The speed values were extracted from the ATRs. Eight groups of speeds were developed between 0 and 50 mph. The ATR values were extracted in 15-minute increments covering the 43-hour period the ATRs collected data and placed into the appropriate speed group. Each 15-minute data sample was ordered by speed group. Based on the

results, the average speed was 28 mph and the 85th percentile speed (85th percentage speed in this case as well) was 32 mph over the entire study period. When removing the peak periods, the average speed was still 28 mph, but the 85th percentile speed was 33 mph. Since the free flow speed is the measurement of the speed during non-congested periods, the 33 mph was assigned the free flow speed for the loop ramp. Once the analysis adjusted for the change in free flow speed from 25 mph to 33 mph, the facility no longer failed since the capacity of the ramp increased from 1,900 vehicles per hour to 2,000 vehicles per hour. [Figure 6-19](#) shows the percent of vehicle speeds by time of day.

Figure 6-19: Loop Ramp Percent of Vehicle Speeds by Time of Day



6.6.8 Entry Control Facility Summary

The ECF analysis was performed once the complete set of external roadway mitigation was established. All mitigation measures were coded into TransModeler™ and several scenarios were tested to determine the minimum number of lanes capable of handling the AM peak hour forecasted FBI vehicle trips. It was determined that five lanes at the Site South Access and two lanes at the Site East Access were required to handle the forecasted demand, although four lanes at the Site South Access may have worked if more queue space was available between the ECF and Frontier Drive Extension. This resulted in the following breakdown of vehicles between the two ECFs:

- South Entrance from Frontier Drive Extension: 683 vehicles or 67 percent
- East Entrance from Metropolitan Center Drive: 341 vehicles or 33 percent

Following the process to ensure statistical accuracy for the simulations, TransModeler™ was used to run 25 simulations for each scenario to calculate the standard deviation based on the VHT metric. [Appendix E11](#) contains the statistical results for determining the minimum number of TransModeler™ simulations required to be

within plus or minus 2 percent at the 95th percentile confidence interval. After the statistical procedure, the following six scenarios were completed:

Site South Access and Frontier Drive intersection and Site East Access and Metropolitan Center Drive STOP-sign controlled (Metropolitan Center Drive westbound approach only)

1. Three lanes at the Site South Access and one lane at the Site East Access
2. Four lanes at the Site South Access and two lanes at the Site East Access
3. Five lanes at the Site South Access and two lanes at the Site East Access

Site South Access and Frontier Drive intersection traffic signal controlled and Site East Access and Metropolitan Center Drive STOP-sign controlled (Metropolitan Center Drive westbound approach only)

4. Three lanes at the Site South Access and two lanes at the Site East Access
5. Four lanes at the Site South Access and two lanes at the Site East Access
6. Five lanes at the Site South Access and two lanes at the Site East Access

Depending on the type of traffic control used for the intersection at the Frontier Drive Extension and Site South Access, the number of lanes required to keep the queues from spilling into the intersection ranges between four and five lanes. Under a STOP-sign controlled operation, the ECF would require five lanes but only four lanes under a traffic signal control. Both scenarios would fail with three lanes resulting in the average queue length for all lanes exceeding the average capacity from 663 feet to 739 feet depending on the intersection control type. Under STOP-control, four lanes would result in the average queue length for all lanes exceeding the capacity by 78 feet. The signal control provides a means of balancing the arrivals in a more consistent manner, thus allowing more time for the vehicles in queue to clear before a new wave of arrivals enters the queue. At four lanes with a signal controlling the intersection, the balance allows enough time for the lanes to clear before the next wave arrives. Under a STOP-sign controlled intersection, vehicles traveling on Frontier Drive Extension in the westbound direction temporarily halting vehicles waiting to turn into the ECF would be the only means of controlling the arrival rate of vehicles.

The Site East Access would require two lanes to avoid a queue backing up onto Metropolitan Center Drive. One lane would result in a queue extending over 730 feet beyond the entrance to the site. [Table 6-17](#) contains the ECF results with a STOP-controlled intersection serving the Site South Access and [table 6-18](#) contains the ECF results with a traffic signal controlling the intersection serving the Site South Access.

Table 6-17: ECF Analysis Results with STOP-controlled Intersection Serving Site South Access

Entrance	Lanes	Three and One Lane					Four and Two Lanes					Five and Two Lanes				
		Vehicles Processed	Proposed Length	Average Queue	Maximum Queue	Pass/Fail	Vehicles Processed	Proposed Length	Average Queue	Maximum Queue	Pass/Fail	Vehicles Processed	Proposed Length	Average Queue	Maximum Queue	Pass/Fail
		Vehicles	Feet				Vehicles	Feet				Vehicles	Feet			
Site South Access	1	202	165	244	1,092	Fail	184	165	78	296	Fail	138	165	52	137	Pass
	2	182	165	72	358	Fail	186	165	76	237	Fail	132	165	43	106	Pass
	3	194	165	192	1,035	Fail	189	165	83	312	Fail	138	165	46	111	Pass
	4						153	165	51	128	Pass	136	165	48	117	Pass
	5											134	165	48	126	Pass
	Average			165		828	Fail		165		243	Fail		165		119
Site East Access	1						180	415	61	149	Pass	171	415	65	158	Pass
	2	205	435	661	1,174	Fail	179	435	67	167	Pass	175	435	67	174	Pass
	Average			435		1,174	Fail		425		158	Pass		425		166

Table 6-18: ECF Results with a Traffic Signal Controlling the Intersection Serving the Site South Access

Entrance	Lanes	Three and Two Lanes					Four and Two Lanes					Five and Two Lanes				
		Vehicles Processed	Proposed Length	Average Queue	Maximum Queue	Pass/Fail	Vehicles Processed	Proposed Length	Average Queue	Maximum Queue	Pass/Fail	Vehicles Processed	Proposed Length	Average Queue	Maximum Queue	Pass/Fail
		Vehicles	Feet				Vehicles	Feet				Vehicles	Feet			
Site South Access	1	204	165	235	983	Fail	178	165	68	161	Pass		165	39	80	Pass
	2	206	165	148	516	Fail	183	165	70	151	Pass		165	47	113	Pass
	3	205	165	265	842	Fail	182	165	68	158	Pass		165	50	124	Pass
	4						179	165	67	148	Pass		165	57	130	Pass
	5												165	59	136	Pass
	Average			165		780	Fail		165		155	Pass		165		117
Site East Access	1	180	415	62	157	Pass	168	415	55	148	Pass		415	64	152	Pass
	2	180	435	66	174	Pass	166	435	60	162	Pass		435	67	170	Pass
	Average			425		166	Fail		425		155	Pass		425		161

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6.6.9 Signal Warrant Analysis Summary

A signal warrant analysis is a quantitative assessment based on traffic volumes and established standards to determine whether installing a traffic signal at a specific intersection is justified, or warranted. The signal warrant analysis was conducted following the guidelines from the 2009 *Manual on Uniform Traffic Control Devices (MUTCD)* (FHWA 2012). To be consistent for all three proposed sites the Virginia Supplement to the 2009 MUTCD, 2011 Edition (VDOT 2011) guidelines were also employed. Combining both methods provides an analysis of two signal warrants per intersection, an average daily traffic (ADT) warrant and a peak hour warrant.

The ADT warrant (following the VDOT guidelines) compares a forecasted ADT volume for the intersection to minimum established ADTs based on the number of lanes along the two intersecting roadways. The forecasted intersection ADT is calculated by applying a 10 percent factor to the AM peak hour forecasted volumes (highest left-turn volume). The volumes are then compared to several tables in the VDOT MUTCD Supplement. The first table in the VDOT MUTCD Supplement contains the urban area minimum vehicle volumes to qualify the intersection; the second table in the VDOT MUTCD Supplement contains the urban area interruption of continuous traffic vehicle volumes to qualify the intersection. Both tables also contain 80th percentile volumes for both cases, which is used in urban areas. Based on the ADT warrant analysis, the Frontier Drive Extension and Site South Access intersection could benefit from a traffic signal but would not meet all the ADT warrants. [Table 6-19](#) contains the ADT warrant summary.

Table 6-19: ADT Warrant Analysis

Warrant	Forecasted ADT	Warrant Minimum Limit	Warrant Check
	vehicles	vehicles	
Frontier Drive Extension and Site South Access			
Warrant 1A – Minimum Vehicular Volume	12,280	9,600	Meets
Warrant 1B – Interruption of Continuous Traffic	12,280	14,400	Fails
Warrant 1C – Combination of 1A and 1B (80%)	12,280	7,680	Meets
	12,280	11,520	Meets

The peak hour warrant following the MUTCD requires two categorical tests. If either of the tests passes, then the intersection meets the warrant. The first category includes three tests: a test of the intersection delay under STOP-sign control, a test of the minor street vehicle volume, and a test of the total intersection volume. The intersection delay test determines if the intersection is under a STOP-control, if the delay for the minor-street would exceed four vehicle-hours (number of vehicles in queue times approach vehicle delay) for one lane. The minor street vehicle volume approach test determines whether or not the vehicle volume exceeds 100 vehicles for one lane. The third test of the total intersection volume examines if the total volume entering the intersection exceeds 650 vehicles for a three lane approach. The second categorical test includes one test based on a plotted chart published in the MUTCD (figure 4C-3; FHWA 2012). The chart plots the highest minor street approach volume against the total major street approach volumes. If the plotted point for the highest minor street approach falls higher than the appropriate curve (based on number of lanes for the major and minor approaches), the peak hour warrant is met.

Based on the peak hour warrant analysis, the intersection of Frontier Drive Extension and the Site South Access would not meet the warrant. The intersection fails all parts of the peak hour warrant except for the total entering volume due to low volumes projected to exit from the minor street and low volumes projected along the Frontier

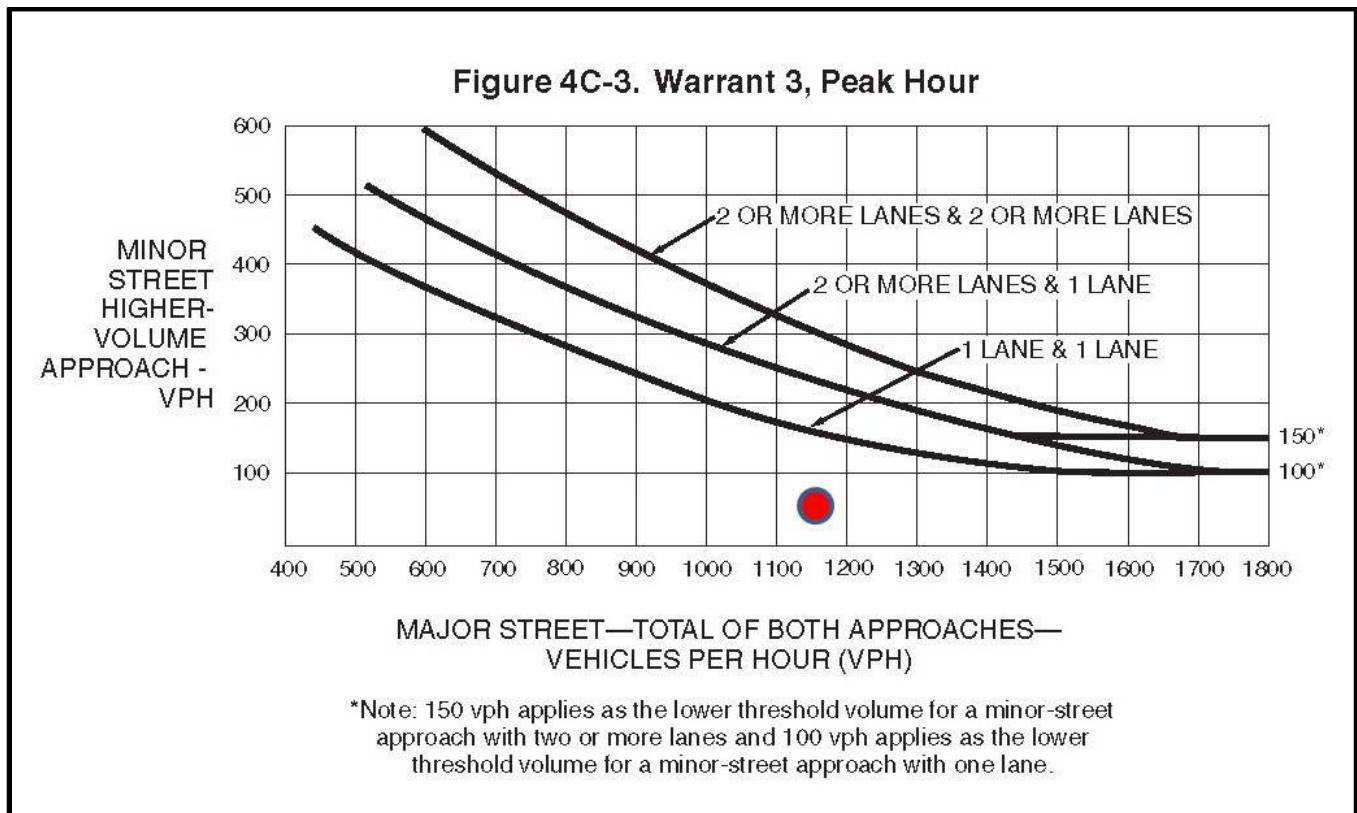
Drive Extension traveling in the westbound direction. Table 6-20 contains the peak hour warrant analysis results. Figure 6-20 shows the MUTCD plotted graph with the intersection point plotted.

Table 6-20: Peak Hour Warrant Analysis

Warrant	Forecasted ADT	Warrant Minimum Limit	Category Check	Overall Check
Frontier Drive Extension and Site South Access				
Warrant 3A1 – Total Stopping Time	<0.01 hour	5 hours	Fails	
Warrant 3A2 – Minor Street Volume	62 vehicles	150 vehicles	Fails	
Warrant 3A3 – Total Entering Volume	1,128 vehicles	800 vehicles	Meets	
Warrant 3B – Plotted Point Falls Above Curve	See Figure 6-20		Fails	Fails

Source: FHWA (2012)

Figure 6-20: MUTCD Warrant 3B - Peak Hour Warrant with Intersection Point Plotted



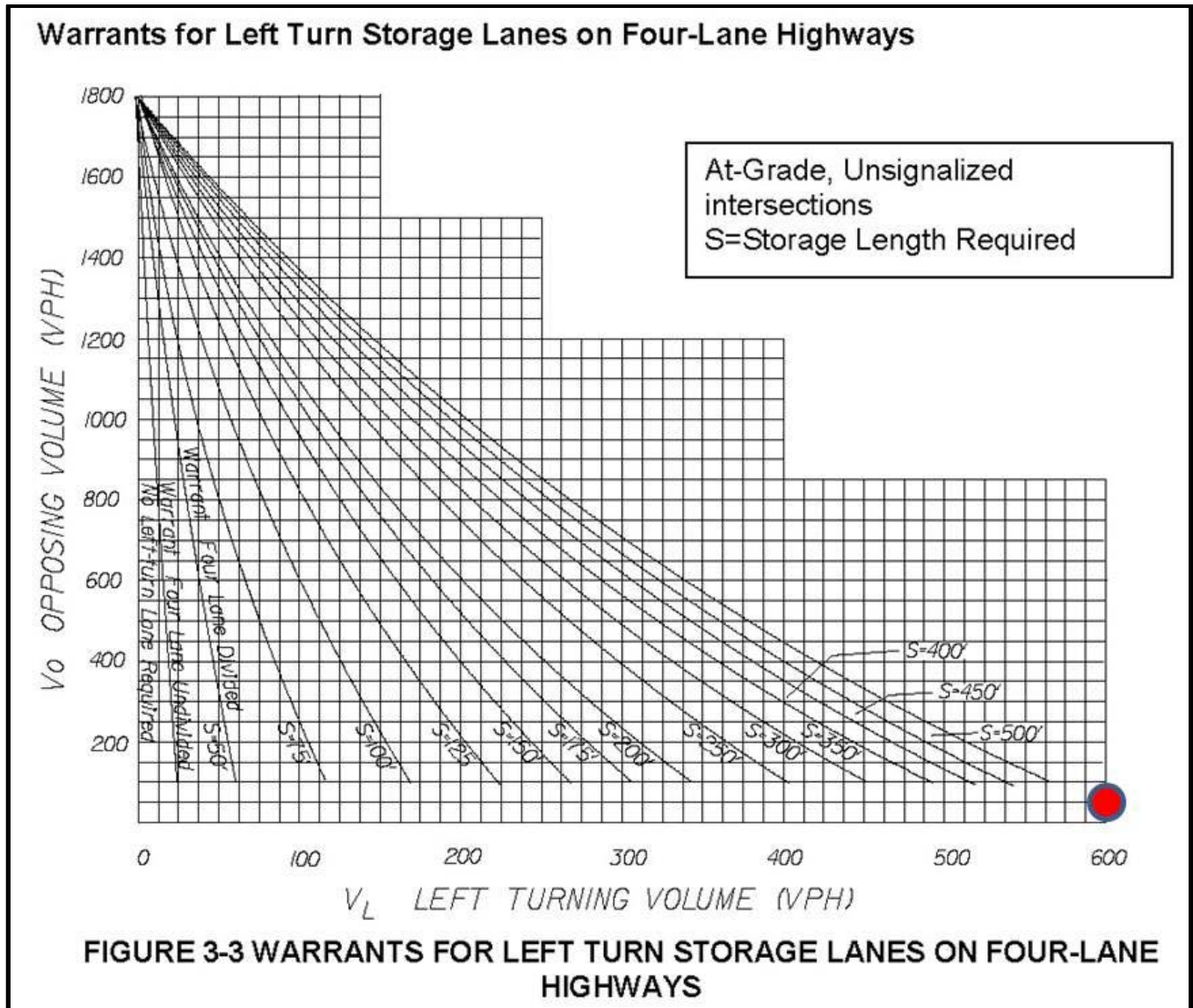
Source: FHWA (2012)

6.6.10 Left-turn Unsignalized Intersection Warrant Analysis

The intersection of the Frontier Drive Extension and Site South Access did not meet either warrant to support the placement of a traffic signal. Therefore, the intersection was further studied to determine if a left-turning lane would be warranted to support a heavy volume of FBI vehicle trips forecasted (over 600 vehicles). Based on the *VDOT Access Management Design Standards for Entrances and Intersections*, Appendix F (VDOT 2008), a special plotted chart must be used to determine if the intersection warrants a left-turn lane (VDOT 2008). If the plotted point is to the right of the plotted curve representing the lowest left-turn storage value (50-foot lane), the intersection warrants a turning lane.

Based on the plotted point, the intersection does seem to warrant at least one left-turn lane (the plotted point is off the chart to the right, but below the plotted curves). The *VDOT Access Management Design Standards for Entrances and Intersections* (VDOT 2008) also states that dual left turn lanes should be considered when the hourly volumes exceed 300 vehicles. This statement recommends a dual left turn operation under signal control based on a volume over 600 vehicles. The Synchro™/SimTraffic™ analysis demonstrated that this intersection would operate at LOS A and have a 95th percentile queue under 100 feet operating as an unsignalized intersection. Therefore, it is recommended to have a left-turn lane to handle the large forecasted volume, but not a traffic signal because the intersection failed both traffic signal warrants. **Figure 6-21** contains VDOT left-turn signal warrant for the Frontier Drive Extension and Site South Access intersection with the intersection point plotted.

Figure 6-21: VDOT Left-turn Warrant for Frontier Drive Extension and Site South Access with Intersection Point Plotted



Source: VDOT (2008)

6.7 Overall Summary

The following summarizes the conclusions of the transportation evaluation:

A total of 3,296 AM peak hour and 3,047 PM peak hour person trips are projected to be added to all modes of transportation. Total Metrorail and Fairfax Connector transit trips are projected as 1,424 AM peak hour and 1,317 PM peak hour trips. Total vehicle trips are projected as 1,099 AM peak hour and 1,015 PM peak hour trips. The remaining trips would be commuter rail, commuter bus, bicycle, or walking trips.

The pedestrian network would expand under the No-build Condition with the inclusion of the Frontier Drive Extension and Metropolitan Center Drive Extension providing a new connection between the Franconia-Springfield Metro Station and Loisdale Road serving Metropolitan Center Drive and the Northern Virginia Community College (NVCC). The inclusion of the Springfield site would allow for the same connections as the No-build Condition, as well as a new connection as part of the recommended mitigation to be provided between Frontier Drive Extension and Franconia-Springfield Parkway directly serving an access point to the Springfield site. This new connection would provide for direct pedestrian connections between the Metrorail station and the Springfield site as well as the NVCC and proposed development near the site, thereby encouraging non-vehicular travel. It is assumed that all sidewalk curb ramps located adjacent to the parcel would also be constructed to ADA compliance.

The bicycle network would expand with the inclusion of the Frontier Drive Extension and Metropolitan Center Drive Extension providing new access between Frontier Drive and Loisdale Road. As part of the recommended mitigation, a new connection would be provided between Frontier Drive Extension and Franconia-Springfield Parkway directly serving an access point to the Springfield site. These new connections would provide for an interconnected bicycle network linking all proposed bicycle facilities in the study area and would encourage bicycle use to access the Springfield site.

The transit network (Metrorail, Metrobus, and Fairfax Connector) would not be affected by development of the proposed action at the Springfield site. The Franconia-Springfield Metro Station and all bus service would operate below capacity with the addition of the forecasted background growth and transit trips from the Springfield site. Three new bus bays are to be added to the Franconia-Springfield Metro Station and would accommodate the projected bus demand, including recommended shuttle buses operating between the station and Springfield site. It is assumed that WMATA would follow their long-term plan to address growth-related capacity issues for both bus and rail operations.

Parking availability would remain the same because the Springfield site would accommodate all parking needs on-site and implement a robust Transportation Management Plan to discourage employees from seeking alternative parking options in the nearby neighborhoods.

Truck access would be designed to accommodate the Springfield site from Loisdale Road at all times. This plan is not the official plan, but a plan to evaluate as part of the EIS. The Loisdale Road access would operate as a truck only access point, although it is assumed that all truck deliveries would be scheduled during the off-peak hours.

The traffic operations at one intersection (Franconia-Springfield Parkway at Manchester Boulevard/Beulah Street) currently operate at an unacceptable level of service under the Existing Condition. Once the background growth, planned developments, and planned improvements are added (No-build Condition), the same intersection would continue to fail. There are a number of planned roadway improvements within the Springfield site study area to compensate for the vehicle trips added from the background growth.

The addition of the Springfield site to the traffic network would result in three intersections operating at an unacceptable level of service. These three failing intersections would experience equal or better operations than

the No-build Condition as a result of recommended mitigation that include new turning lanes, extended turning lane lengths, new travel lanes, and a new roundabout. Overall, the roadway non-Interstate network would operate much better and experience shorter queues with the addition of the recommended mitigation when compared to the No-build Condition.

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8.0 Acronyms and Abbreviations

A

AADT	Annual average daily traffic
ADA	Americans with Disabilities Act
ADT	Average daily traffic
APTA	American Public Transit Association
ATR	Automated Traffic Recorder

B

BLS	Bureau of Labor Statistics
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C

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CUP	Central Utility Plant

D

DDOT	District Department of Transportation
DTA	dynamic traffic assignment

E

ECF	Entry Control Facility
EIS	Environmental Impact Statement

F

FBI	Federal Bureau of Investigation
FXC	Fairfax Connector
FCDOT	Fairfax County Department of Transportation
FHWA	Federal Highway Administration

G

GIS	Geographic Information Systems
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GSA	General Services Administration
GSF	Gross Square Feet
H	
HAWK	High Intensity Activated Crosswalk
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
HQ	Headquarters
HOV	High Occupancy Vehicle
I	
ISC	Interagency Security Committee
ITE	Institute of Transportation Engineers
J	
JEH	J. Edgar Hoover
L	
LCT	Loudoun County Transit
LOS	Level of Service
M	
MEV	million entering vehicles
M-NCPPC	Maryland National Capital Park and Planning Commission
mph	miles per hour
MUTCD	Manual on Uniform Traffic Control Devices
MWCOG	Metropolitan Washington Council of Governments
N	
NCPC	National Capital Planning Commission
NCR	National Capital Region
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association

O

OPO Old Post Office

P

PHF peak hour factor

P-MD Prince William Metro Direct

PRTC Potomac and Rappahannock Transportation Commission

R

RDF Remote Delivery Facility

RFDS Reasonably Foreseeable Development Scenario

S

SDDCTEA Surface Deployment and Distribution Command Transportation Engineering Agency

SF Square Foot

SOV Single Occupant Vehicle

T

TAZ Transportation Analysis Zone

TDM Travel Demand Management

TIA Transportation Impact Assessment

TIP Transportation Improvement Program

TMP Transportation Management Plan

TRB Transportation Research Board

TWSC Two-way STOP-Controlled

U

U.S. United States

USDOJ U.S. Department of Justice

V

v/c volume-to-capacity ratio

VC Visitor Center

VDOT	Virginia Department of Transportation
VHT	Vehicle hours of travel
vph	vehicles-per-hour
VRE	Virginia Railway Express
W	
WMATA	Washington Metropolitan Area Transit Authority